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BUREAU OF SUGAR EXPERIMENT STATIONS



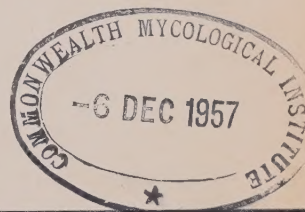
57th ANNUAL REPORT OF THE DIRECTOR TO THE HON. THE MINISTER FOR AGRICULTURE AND STOCK

(As required by "The Sugar Experiment
Station Acts, 1900 to 1954")

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BRISBANE
QUEENSLAND
1957





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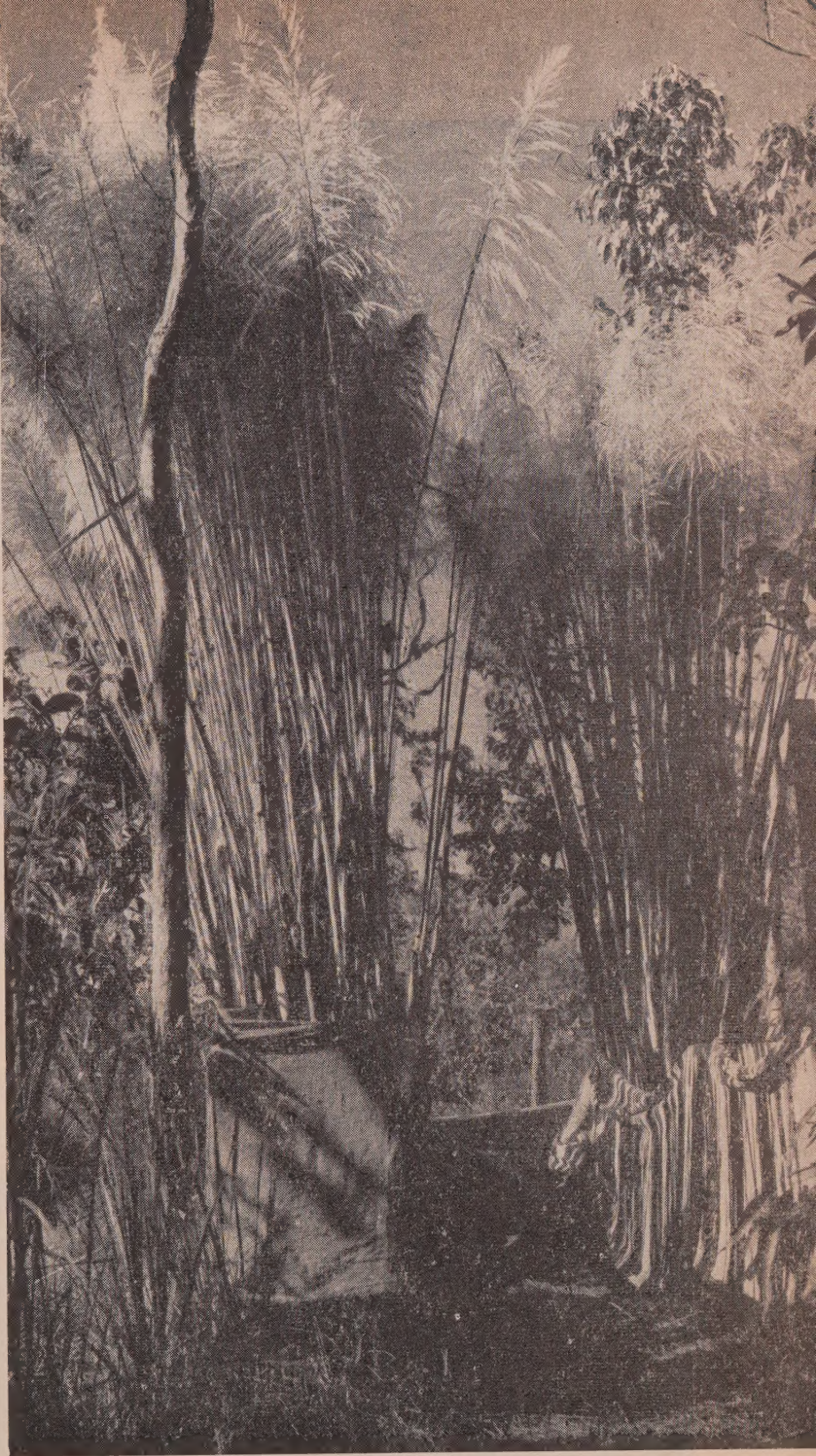
57TH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

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Our Cover

The excellent cane crop is the new variety Q.67 in the Lower Burdekin where it promises to come into favour. The mill is South Johnstone from an unusual angle, and the Queensland map indicates, for non-sugar readers, the location of the Sugar Experiment Stations.



Portion of a poly-cross in the Meringa cane breeding area.

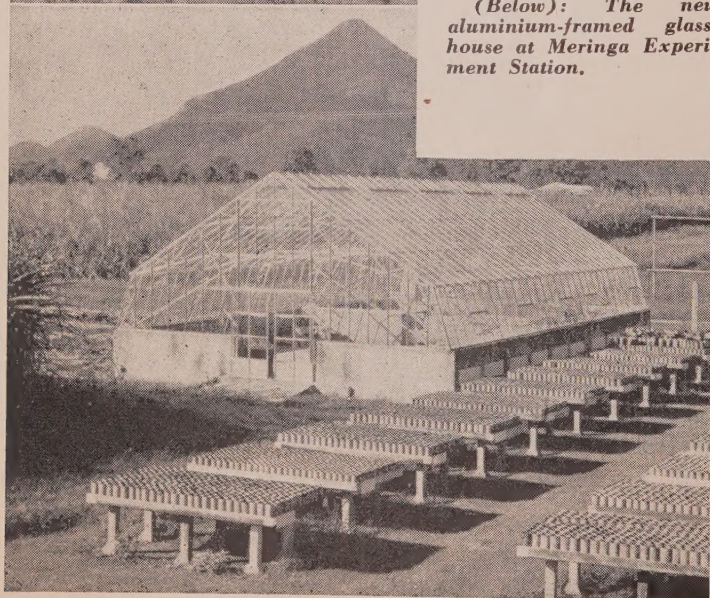


(Above): Hand planting of a seedling trial on a Sugar Experiment Station.

(Left): The Rt. Hon. the Prime Minister (Mr. R. G. Menzies) at Meringa Sugar Experiment Station in April, 1957.

(Right): Giant Sensitive Plant (Mimosa invisa) climbing over and smothering a sugar cane crop in the Innisfail district.

(Below): The new aluminium-framed glass-house at Meringa Experiment Station.



FIFTY-SEVENTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

*To the Honourable the Minister
for Agriculture and Stock*

Dear Sir,

I have the honour to submit the Annual Report of the Bureau of Sugar Experiment Stations for the year ended June 30th, 1957.

My introductory remarks cover some brief comments on the 1956 sugar season, the prospects for the 1957 crushing, and the work of the Bureau staff during the year under review. More detailed reports of the work of the various divisions are given under the headings of soils and agronomy, plant breeding, entomology, pathology, and mill technology. In addition, the operations of our four Experiment Stations are reviewed and the usual space is allocated to industry statistics.

REPORT OF THE DIRECTOR

During the year, the work of which is reviewed in this report, the staff of the Bureau was occupied to the full in implementing the various programmes of investigational and research work which were drawn up prior to July, 1956. The activities of the agricultural divisions were directed at improvements in varietal performance, disease eradication, pest control, fertilization and general agronomic practices, and as much time as practicable was devoted to extension and advisory work. With existing staff strength a full and satisfactory coverage of both investigational and extension work is not being achieved, due to the increasing demands of the industry for improved services. Personal contact, at regular intervals, with over 8,000 canegrowers is a desirable target, but it can be attained only at the cost of reducing the research programme.

Greater use is being made of the sugar district press and of the radio broadcasting stations to keep the farming community advised on matters of interest and, in some areas, lectures and

demonstrations to junior farmers' organisations are creating interest by the younger growers in the technical aspects of sugar agriculture.

On the mill research side the growing number of requests for assistance in manufacturing problems is similarly reducing the time which can be devoted to purely research projects. But it is probably of more immediate importance to improve mill performance by "trouble-shooting" investigations than to devote all the division's activities to research work.

THE 1956 SEASON

During the 1956 crushing season, which extended from June 6th, 1956, to January 4th, 1957, the treated crop aggregated 8,978,081 tons of cane. This exceeded the previous year's crushing but it fell short of the record 1954 figure by 886,224 tons. The restrictive measures imposed by available sugar markets are, in some degree, responsible for the below record crop, since farm peaks have a measurable effect on yearly plantings; but in this year the damage done by the March, 1956, cyclone outweighed any planned restriction of output.

The area harvested to produce this weight of cane was 360,932 acres. Although somewhat lower than in the previous two seasons there was no marked falling off, and the general expectation for the industry with existing assignments and markets will probably be a figure fluctuating between 350,000 and 380,000 acres. The amount of 94 n.t. sugar produced per acre was 3.25 tons.

Sugar production, in terms of 94 n.t. standard, amounted to 1,171,509 tons which was just in excess of the State's "peak", and was only some 8,000 tons of sugar above the estimate prepared prior to the 1956 season. The quality ratio of the crop was poor, and some 7.66 tons of cane were required to make each ton of 94 n.t. sugar. This state of affairs was largely the result of the March, 1956, cyclone which either flattened or decapitated large areas of cane from Proserpine to Mossman.

New South Wales cane and 94 net. titre sugar production for the 1956 season amounted to 294,428 and 35,904 tons respectively.

The outstanding climatic feature of the pre-crushing-season weather was the disastrous cyclone in March, 1956, which affected in greater or lesser degree all areas from Mackay northwards. The cyclone's greatest intensity, as measured by crop damage, was in the Babinda district, but it caused serious crop losses in all areas from Tully to Cairns. Unlike the normal run of tropical cyclonic disturbances the 1956 specimen was unaccompanied by rain and much of crop breakage—as distinct from lodging—was the result of this circumstance. The damage was, naturally, overestimated since it was not possible to foresee the speed and extent of revival even in cane which had been completely decapitated.

The highlight of the industry's progress was the completion, in 1957, of the first bulk sugar terminal, situated in the Mackay district. This installation, with a storage capacity of 150,000 tons of raw sugar and a ship loading rate of 650 tons per hour, is the first step in the industry's plan to equip all major sugar ports. The sugar from Mackay's seven mills is being conveyed to

the terminal in specially designed bins fitted to road transport and railway wagons. It is anticipated that, by the start of the 1958 season both Bundaberg and Lucinda Point terminals will also be in operation. Not the least of the benefits expected to accrue from this advanced form of mechanical handling will be the better shipping service to the industry because of the very great reduction in turn-around time.

It has become customary to compare crushing-rate progress year by year by taking a look at the total tonnage crushed by the State's 31 mills at the peak of the season. In 1956, over a period of seven weeks in the middle of the crushing period, the average weekly input of cane was 387,724 tons, being some 15,000 tons per week higher than in 1955.

PROSPECTS FOR THE 1957 SEASON

In last year's survey some comments were recorded relating to the exceptional succession of good seasons experienced throughout the sugar belt for a period of five years. Admittedly the five-year period was marred by excessive rain in some divisions, by a cyclone in the north in 1956, and by various localised disabilities which detracted from the value of the excellent crops produced. But, by and large, the period was one of above average seasons, and the favourable climatic factors were largely responsible for the rapid development which took place during a planned expansion phase.

For 1957 the picture has changed and the position in South Queensland is a reminder and a demonstration of the critical balance in that area between rainfall and productivity. North of Townsville a deficiency of 15 inches of rain in the crop year would not seriously affect the final tonnage, but in the south it can, within the space of one season, halve the production. South Queensland will be a million tons of cane down compared with the 1956 crop, and it is a fortunate circumstance that this deficiency will be largely counterbalanced by an increase in the more favourably situated areas.

The early crop estimate, prepared in May, 1957, indicates that an aggregate crop of 8,863,000 tons of cane might be expected, and



Fig. 1—Unpacking and examining canes received from the Warner-Grassl expedition in New Guinea. These, after suitable treatment, have been quarantined on Magnetic Island.

that the anticipated 94 n.t. sugar output will be 1,195,700 tons. The crop, as predicted, is about 115,000 tons short of the 1956 crushing but, due to higher sugar content, it should produce 24,000 tons more sugar. Even so, the forecast is below the State's sugar peak of 1,203,900 tons. Early returns from the mills which began operations in June, 1957, confirmed the expectation of higher sugar content of cane, and it is possible that, with favourable conditions in the spring, the sugar production may rise to peak proportions.

The individual district figures indicated that the 1957 harvest would be drawn from 375,000 acres which would be about four per cent. higher than in 1956. It is doubtful if this figure will be attained. The South Queensland drought will markedly affect the area to be harvested and much cane will either be ploughed in as unsuitable for cutting or stood over in the hope of obtaining a two-year crop in 1958. It would appear that the harvested area will, following the expansion period, stabilise itself around the 360,000 to 380,000 mark in contrast with the 260,000 to 280,000 acres prior to 1953.

It is indeed fortunate that the frosty conditions which are almost inseparable from a drought year in the south were conspicuous by their virtual absence this winter. Although isolated crops were affected by low temperatures there is a marked contrast between 1957 and 1946. In the latter year the southern districts recorded heavy and continuous frosts in June which played havoc with the dried out and stunted crops.

The commencement of the 1957 crushing season in June was marred by considerable rain in the far northern areas. Harvesting and transport were adversely affected and crushing rates were below the anticipated figures. This unseasonal weather was the only impediment to a good start since labour was more plentiful than normal, crops were good and erect, and the growth record of the crops was indicative of a high sugar content.

New South Wales production for 1957 is expected to be 282,000 tons of cane and 34,300 tons of 94 n.t. sugar.

The Composition of the Crop

Queensland-bred canes fell slightly in their proportion of the total crop. The reasons why this upward trend was halted temporarily were (1) the damage occasioned to Pindar in the pre-harvest cyclone, (2) the very good season in South Queensland which boosted the production of C.P.29/116, and (3) the increasing quantity of N.Co.310 which was grown. These two imported varieties aggregated 1,145,875 tons and this was 174,600 more than in 1955. There is little doubt that next year will see a return to the annual rise in Queensland-bred canes; the drought in South Queensland will reduce the amount of C.P.29/116 and N.Co.310 to be harvested and there is a general trend for newer local productions to replace some of the imported types.

Badila

This once famous variety recorded a further fall in tonnage produced during the year. The figure of 468,937 tons is 58,000 tons below the 1955 crop and we will doubtless witness some fluctuation in production from now on. Following the 1956 cyclone there was a resurgence of interest owing to the wind damage suffered by Pindar. The effect of this will be noticed in the 1957 crop. However, it is not expected that the tonnage grown will show any marked increase; Badila's outstanding value as a good sugar content variety for early harvesting is not fully appreciated.

Q.50 Premier Cane for Fourth Year

Once again Q.50 retained pride of place in the cane variety census. The tonnage harvested was some 23,000 higher than the previous year

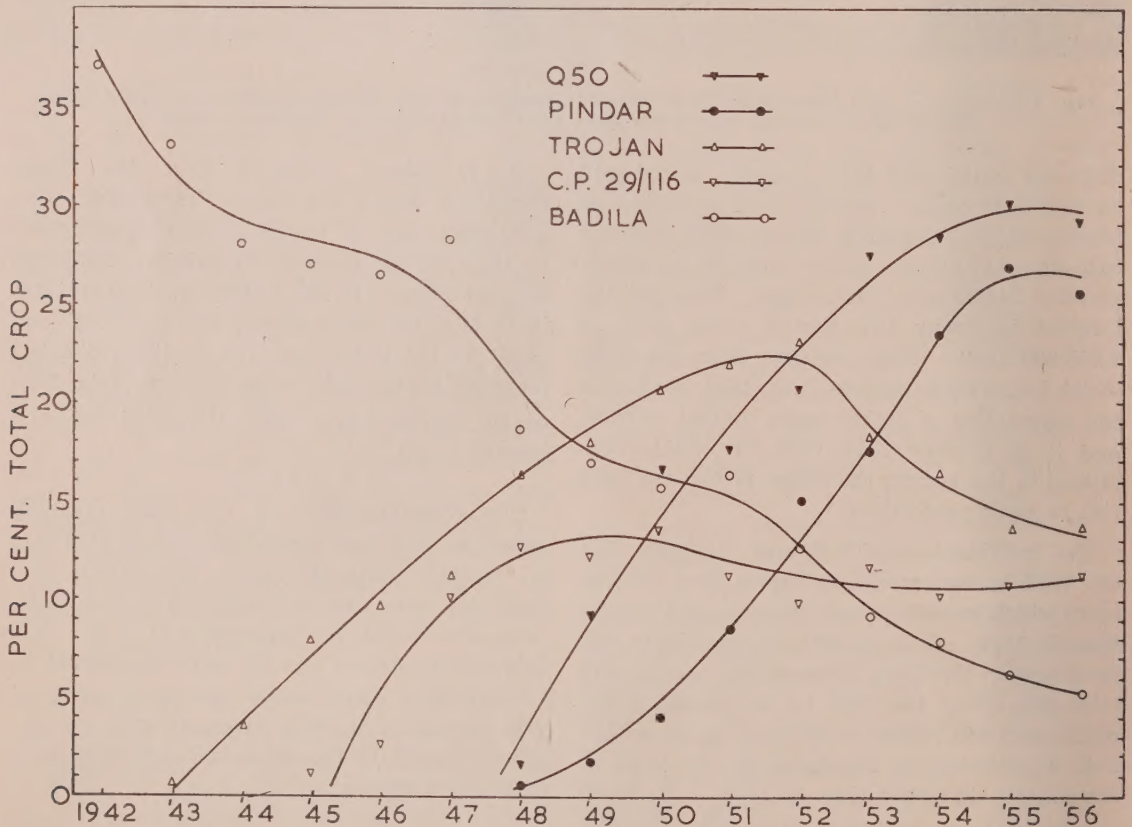


Fig. 2—Illustrating the decline of Badila, the rise and fall of Trojan, the probable falling off of C.P.29/116 and the levelling out of Q.50 and Pindar. Points on the curves represent percentages of the total crop.

and it constituted nearly 30 per cent. of the State's crop. It is difficult to forecast whether Q.50 has yet reached its peak. There is still some increase in the acreage being planted to it in some of the southern areas, and the variety is attracting interest in non-irrigated sections of the Lower Burdekin district. At the same time much Q.50 is being displaced in Mackay itself by later "Q" canes, and this is a good thing for a district which based its economy too much on one cane variety.

Mill Crushing Rate

For the first time in Queensland's history the average crushing rate of the 26 mills, whose figures are recorded, rose to over 100 tons of cane per hour. The diagram in the text of the report is an interesting record of how mill capacity has grown since 1943. Even in 1948, when the effects of the war had been left behind, the average crushing rate was only 66.33 tons per hour. The steepest rise has been since 1951

and this marks the period of large scale expansion of cane production in the field and sugar production in the factories. The peak has not yet been reached even though the industry has settled down somewhat after the rush period. There is still considerable interest in raising crushing rates to obviate operating after the end of December.

The Crop Rotation

The details given in Table III of this report record the acreage of plant and ratoon cane harvested in the four divisions of the sugar belt. Under the cane rotation normally practised in Queensland—one plant and two ratoon crops—the ratoon/plant ratio would, theoretically, be 2. In 1956 season the far north recorded a ratio of 2.40, the Lower Burdekin 0.94, the central district 1.41, and the south 2.30. The figures point to a greater reliance than usual on ratoons in the northerly areas, but the figures in the Lower Burdekin indicate an adherence



Fig. 3—The Magnetic Island quarantine plot where the New Guinea canes are being grown in isolation. Dr. J. Warner (left) inspects the young cane.

to the "plant cane" policy which is so firmly entrenched in that region. Mackay's ratio is also well below the expected figure, considering that the district's varieties are good ratooners.

The Quality Ratio

The figure recorded for the year—7.66 tons of cane required to make a ton of sugar—was the worst for many years. Much of the blame for the poor figure, apart from the trend from noble to hybrid cane varieties, lies in the cyclonic season and the exceptionally cloudy year in the "wet" areas. The cyclone-damaged cane was of low sugar content and the position was not improved by the amount of extraneous matter which accompanied the cane to the mills.

BUREAU INTERESTS AND ACTIVITIES

Downy Mildew Disease Confined

The single-farm outbreak reported last year has not spread beyond the plantings in which

it was discovered. The more heavily infected blocks were ploughed out and careful inspections have been made frequently on all other crops on the affected and neighbouring farms. The dry summer of 1956/57 and the following dry autumn doubtless assisted in preventing further spread of the disease. The source of this mysterious outbreak has not been discovered.

Plastic Irrigation Fluming

The use of flexible plastic tubing as a water carrier on irrigated farms is an overnight development in the sugar industry. The polythene material being used is not made specifically for the purpose, and the working life of the 12-thousandths inch thickness material is not known. The enthusiastic reception of this means of conveying water springs from the cost of constructing and maintaining open earth ditches, the obstacle they present to cultivators, and the water losses experienced as the result of

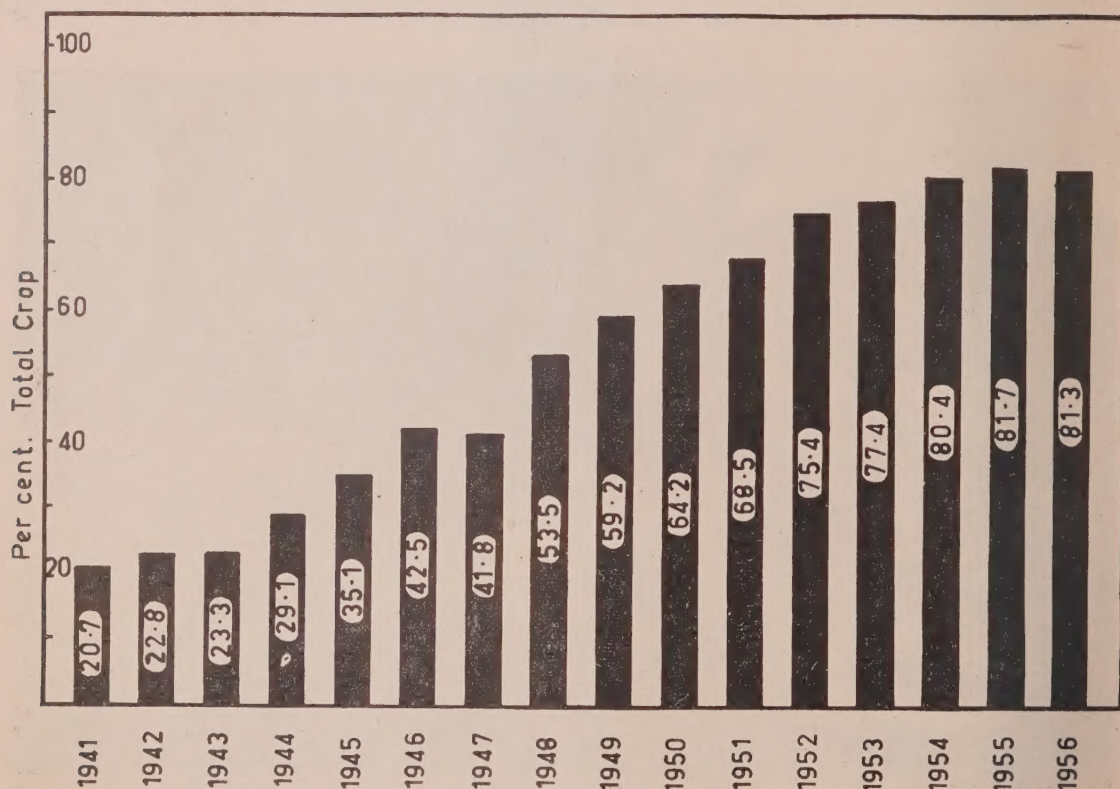


Fig. 4—The percentage of Queensland-bred canes in the total crop, although rising from 20.7 to 81.7 between 1941 and 1955, showed a slight fall in 1956.

seepage. There would appear to be a large potential demand for a plastic water carrier with reasonable life expectancy, and one can predict rapid development in this revolutionary method of directing water flow from point of origin to point of usage.

Urea

Australia has lagged for many years behind other progressive agricultural countries in the use of modern fertilizers. The more concentrated nitrogenous and phosphatic fertilizer materials, although in common use overseas, have not had a chance to compete in this country with the traditional sulphate of ammonia and superphosphate. Freight constitutes such a high proportion of present day total costs of commodities that consideration must be given to using materials with higher contents of nitrogen and phosphorus. The advent of urea (46 per cent. nitrogen) is a case in point and, although imported from overseas, it is competing with locally made sulphate of ammonia (20.5 per cent. nitrogen). On a cost per unit nitrogen basis urea is a better buy and extensive field experiments have shown that it is equally efficacious in crop and sugar production.

Giant Sensitive Plant

This extremely dangerous weed pest continues to show up in new locations and to spread in some of the older ones. A year ago it was not known to exist outside the Tully and Innisfail districts, but in the intervening period it has been found at Mossman, Ingham, Proserpine, and Mackay. The several findings in the three last-mentioned areas are all associated with plantings of *Centrosema pubescens* (Centro), a perennial tropical legume which is valued as a pasture plant. Seed of this legume is imported from countries where giant sensitive plant (*Mimosa invisa*) exists, and the latter is being introduced as an adulterant in the Centro seed. Cane growers are alive to the dangers of the pest plant and they are active in attempting to control and eradicate it on assigned lands. But a continuing threat to sugar producing country will be the spread of the plant on adjacent grazing or unoccupied land. Consideration is

being given to an amendment to the Sugar Experiment Stations Acts which would allow giant sensitive plant to be defined as a cane pest. Such an amendment would provide powers to Cane Pest and Disease Control Boards to expend funds on control and eradication of the weed on assigned lands.

New Laboratory at Mackay

After fifty-seven years of service as a Sugar Experiment Station laboratory and office the old structure at Mackay was replaced by a modern brick building. This coincided with the establishment of soils investigation facilities in the area and improved services to the cane growers of the district. The Mackay district, producing one-fifth of the State's sugar, is now based almost entirely on varieties raised and selected on its own Experiment Station, and even the most critical could not argue that the money invested in the Station has not borne excellent dividends. The Chairman of the Sugar Experiment Stations Board, the Hon. H. H. Collins, declared the new building open on the occasion of the Annual Field Day on May 23rd.

Bureau Plans to Build in Brisbane

The Bureau's architects have completed plans and specifications for a new headquarters building in Brisbane. For over forty years the administrative headquarters of the Bureau have been in the Department of Agriculture and Stock building, and the Bureau was a branch of that Department until 1951. The numerical growth of the organisation, combined with the increasing space requirements of the Department, have made it essential that the Bureau seek new quarters for its expanding activities. A modern structure has been designed to occupy an excellent site on Gregory Terrace and the new building, with a planned floor area of over 15,000 square feet, will accommodate administrative and laboratory staff.

Research Glasshouse at Meringa

The destruction of the glasshouse at Meringa in the 1956 cyclone gave the opportunity to erect a new glasshouse of a type more suited to modern cane breeding work. The replacement

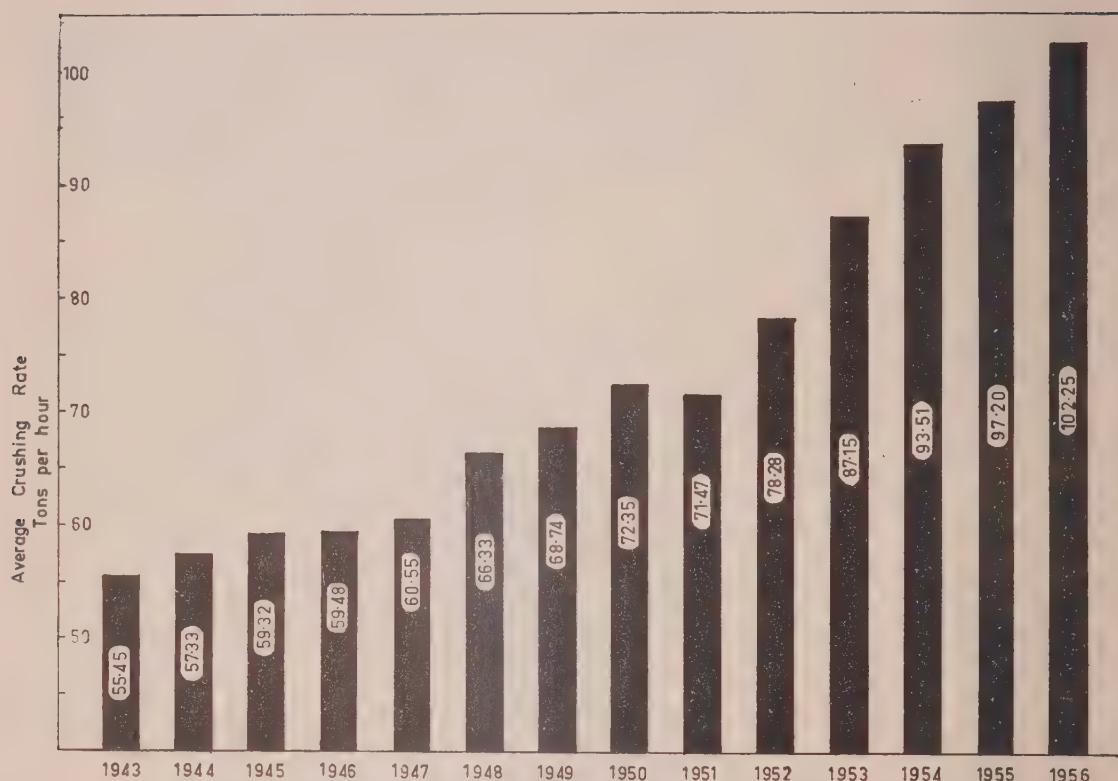


Fig. 5—Average Crushing Rate—Queensland mills (excluding C.S.R. mills and Rocky Point): Pioneer and Inkerman excluded 1943 and 1944. Mt. Bauple ceased operation after 1950.

structure, of rustless metal-frame design, fulfils all the requirements for seedling raising. In addition, a partitioned section, electrically heated and thermostatically controlled, provides adequate space and height for arrowed canes so that pollen supply and seed setting may be improved at higher than ambient temperatures.

The New-Variety Supply

During the year plans were finalised for the distribution and approval of Q.63 and Q.65 at Mackay, Q.66 in the far north, Q.67 in the Lower Burdekin, and Q.70 in Bundaberg. These are all worthy additions to the approved variety lists either as general or particular purpose canes. Q.67 is the first variety raised and selected at the Lower Burdekin Experiment Station which would appear to have promise of becoming a commercial cane. In last year's report Q.67 was mentioned as a lodging resistant type under the seedling number L.469. The illustration on

page 38 shows this characteristic in a block where it was grown alongside Trojan. Q.67 should be a valuable variety on the high-producing soils of the Lower Burdekin.

APPOINTMENTS AND RESIGNATIONS

Dr. H. E. Young was appointed as Senior Physiologist.

Mr. E. D. Jensen was appointed as Asst. Mill Technologist.

Messrs. J. E. Milliken, I. J. V. Stewart, and K. E. Newman were appointed as Field Assistants.

Mr. E. A. Pembroke, Senior Adviser, resigned.

Three clerk-typistes and a junior clerk resigned and were replaced.

PUBLICATIONS BY BUREAU STAFF

In the Proceedings of the Queensland Society of Sugar Cane Technologists.

Barrie, A. G.: Varietal Differences in Post-Harvest Varietal Deterioration.

Deicke, R.: Further Investigations into Wax Extraction from Wet Filter Mud.

King, N. J.: A Study of Low c.c.s. at Babinda.

Moller, R. B.: Poor Ratooning in the Bundaberg District during 1956.

Nicklin, J. H.: The Economic Aspect of the Production of Paper from Bagasse.

In the Australian Plant Breeding and Genetics Newsletter.

Skinner, J. C.: A Technique for Keeping Cut Flowers Alive during Cross-Pollination.

Operations Reports.

57/1: Tests on Fly Ash Arresters at Millaquin Mill—1956 Season.

Annual Synopsis of Chemical Control Figures.

Twenty-fifth Edition.

Periodic Publications.

Four numbers of the Cane Growers' Quarterly Bulletin and four News Letters were issued.

New Service to Northern Mills

The transfer of a member of the Mill Technology staff to North Queensland was the second step in decentralisation of this division. With headquarters at Meringa Experiment Station this officer will be available at short notice to far northern mills who may desire his services for investigational or trouble shooting work. It is planned to extend a similar service to other major districts in the future. Laboratory facilities have been provided at Meringa and these will be improved in accordance with the demand for research. The success of this move is already apparent in the demand for attention to problems in several northern factories.

The Mill Technology Division

The appointment of another experienced mill chemist to this Division during the year increased the numerical strength still further. The principal work of the Division in the 1957 season will be on an investigation of certain aspects of cane payment sampling and analysis; this will be in co-operation with Central Cane Prices Board staff. The investigation stems from requests by various sections of the sugar industry to conduct research into some phases of the matter. It is anticipated that the investigation will be a continuing one over a period of several seasons. The c.c.s. formula has served the industry well over a long period of years and, despite its deficiencies, it is unlikely to be supplanted by any new method except as the result of long and patient investigation.

Sunshine and Sugar Content

The series of wet years in the far northern areas focused attention on the falling sugar content of the average cane supply. The decrease in c.c.s. is probably not the result of a change in one factor but is more likely a combination of changed varieties, increase in extraneous matter, and the climatic effect. The lastmentioned is considered to be the most important since in wet years the incidence and intensity of cloud are greater. Investigational work in other countries has pointed to the loss of both crop and sugar content under reduced light conditions. There are no records of sunlight or radiant energy in the high rainfall belt, but arrangements have been made for the Bureau to instal sunshine recorders in the Babinda district this year and to collect data on the matter. It is of importance to determine whether a correlation does exist between sunlight hours and sugar content, even though the weather cannot be altered to suit the crop. Once it is known that cloud is the principal reason for low sugar content an attempt can be made to select canes which are most efficient at sugar storage in a cloudy environment. But there is a dearth of knowledge in this field, and it remains to be established whether cane breeding can evolve varieties which can

manufacture and store sugar efficiently in a low-sunlight location.

In the meantime a direct approach to the problem is being made by introducing into the wet areas a range of cane varieties of the high-sugar type to ascertain whether they will improve the sugar position. At the same time the nutritional aspects of the crop are not being ignored and further trials are being initiated to check the nitrogen-potash balance and its effect on sugar production.

Mosaic of Sugar Cane

At the time when Queensland had so many more serious cane diseases taking toll of its crops mosaic was not classed as a serious threat. However, as shown in Louisiana and elsewhere, it can prove a serious brake on production where susceptible varieties are grown extensively. In Queensland the disease extends from Nambour to Ayr and in some districts, notably the Lower Burdekin and Bundaberg, a planned campaign by the respec-

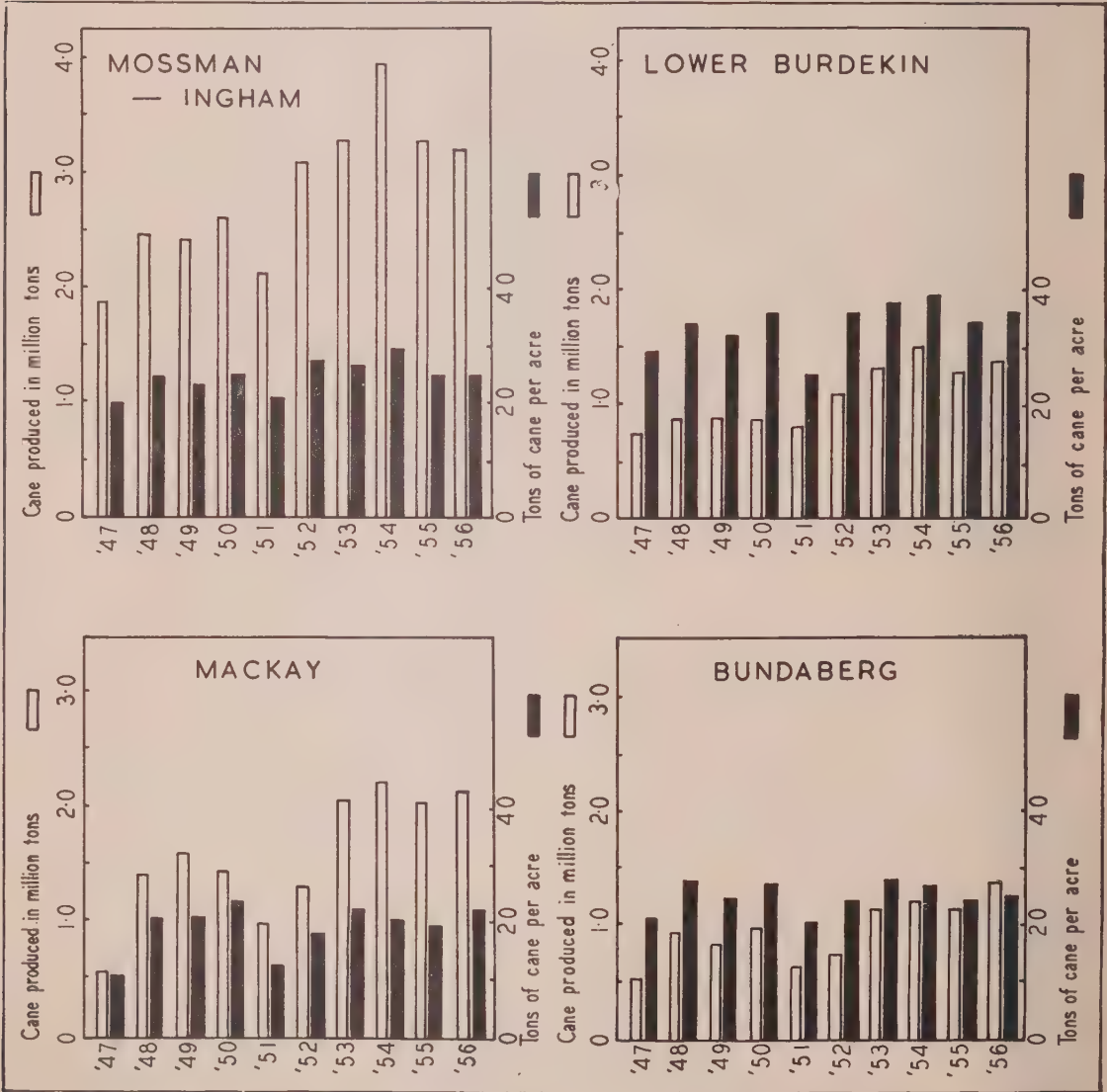


Fig. 6—Total cane production and tons per acre in the four major districts during the past ten years.

tive Cane Pest and Disease Control Boards has reduced mosaic incidence to very low proportions even in the presence of susceptible varieties. Mackay constitutes the principal mosaic centre to-day and there is justification for a determined effort to reduce the disease in that area. The amount of mosaic disease in

that area is particular must

From . . .

Commonwealth Mycological Institute

Ferry Lane, Kew, Surrey, England

The Librarian,
Levington Research Station,
Levington,
Ipswich,
Suffolk

RD

in 1956 . . .

drought year — mainly because of the freedom from killing frosts up to the end of June. Varieties have also played a part in maintaining production at a higher level. The seriousness of the position in 1946 can be assessed by referring to harvesting figures for that year; the six Bundaberg and Isis mills crushed only 323,000 tons of cane that year. For 1957 their estimate is 910,000 tons.

A Milestone in Progress

The Annual Conference of the Queensland Cane Growers Association at Cairns in April provided a suitable opportunity for a presentation by the Cane Growers Council to the Bureau of Sugar Experiment Stations. A bronze plaque, marking the appreciation of the cane growers of Queensland for the cane-grub control work of the Bureau entomologists, was handed over by the Chairman of the Council, Mr. B. Foley. The plaque was received by Mr. A. F. Bell, Deputy Chairman of the Sugar Experiment Stations Board. It was a happy circumstance that the Rt. Hon. the Prime Minister of

Australia, Mr. R. G. Menzies, was able to attend the function, and he paid a tribute to the conscientious endeavours of the scientists who were largely responsible for the progress of our agricultural industries. The extent of the grub damage on farms in the Lower Burdekin this year where BHC was not used, and where heavy beetle flights occurred, is a sharp and timely warning of what may happen in all northern

Enigma

his mysterious disease than it was a decade ago. Since it was first noticed in Queensland in 1935, and spread to the far northern regions in the following years it has remained a mystery. The Moreton, Proserpina, Bundaberg, and Isis means accepted that the disease has followed introducing material, and some of the main incomprehensible. The disease are continuing. If the disease and the mode of

spread could be established a practical means of control and eradication may then be devised. Despite the many studies made by pathologists in several sugar producing countries there is no real evidence that the causal agent is a virus. A broader approach to the problem of identification appears desirable.

Quality Deterioration in Harvested Cane

Some initial work on the decline in c.c.s. after burning and harvesting has pointed to a varietal effect. Much sugar is lost between time of harvest and time of crushing and juice analyses at the mill due to deterioration within the cane stalk. Similar studies have been made overseas and it is becoming more important for Queensland cane growers to gain an understanding of what occurs in the cane after it is burnt and harvested. Appreciable delays between harvesting and milling are common, particularly due to week-ends, and the position is worse in the wet belt where heavy rains frequently delay the loading and transport of cane already cut down.

Deterioration studies could result in the weeding out of those canes which show a faster than normal decline rate.

Variety Exchange

Complementary to the cane breeding programme is the never ending project of cane importation from other countries. Outstanding varieties in the industries of other lands, canes which have shown promising results as parents in breeding, newly discovered wild canes with no known pedigree, and a miscellany with some particular character of interest form a constant procession through the quarantine house. At the same time there is an outward flow of varieties to other countries which are seeking our material. Some countries benefit considerably from this exchange process and, although Queensland is now largely dependent on locally bred varieties, it must not be forgotten that C.P.29/116 and N.Co.310 are

parent material. During the past year the imported canes numbered 36, in addition to the 254 New Guinea canes, collected by the Warner-Grassl expedition, and which are now quarantined on Magnetic Island.

Droopy Top—Copper Deficiency

Each year the number of reported cases of this trace element deficiency becomes greater. This is not interpreted as a progressive depletion of our sugar producing soils. It is more likely due to the extension of cane growing on to less suitable marginal lands of a sandy nature, as well as to the extension of knowledge that the "droopy-top" symptoms and the green "islands" on the leaves are indicative of copper deficiency. There is, as yet, no evidence that our average or good quality sugar lands are becoming deficient in copper.

The "Sugar per Acre" Criterion

The low sugar content of cane in some Queensland areas, and a study of some of the factors involved, has led to critical examination of the "sugar per acre" figure as a criterion of crop value. The formula by which a producer is paid for his cane is based largely on the sugar content of the crop—with a premium on high sucrose; but many growers tend to prefer the more vigorous, lower sugar-content cane if it produces the larger amount of sugar per acre. It can be shown, in many such cases, that the higher harvesting and haulage costs per acre on the more vigorous cane make it of less net value to the producer, despite the greater tonnage of sugar. Since the more vigorous cane is, in many cases, also the most prone to lodge the economic difference becomes greater because of the higher harvesting charges. Unless considerable success is achieved in the development of anti-lodging canes there would appear to be a critical point in crop magnitude beyond which the economics of intensified agriculture will need careful consideration.

The Pathology Farm

The Bureau's property near Brisbane which has been developed in recent years as a Pathology Farm is probably the only such

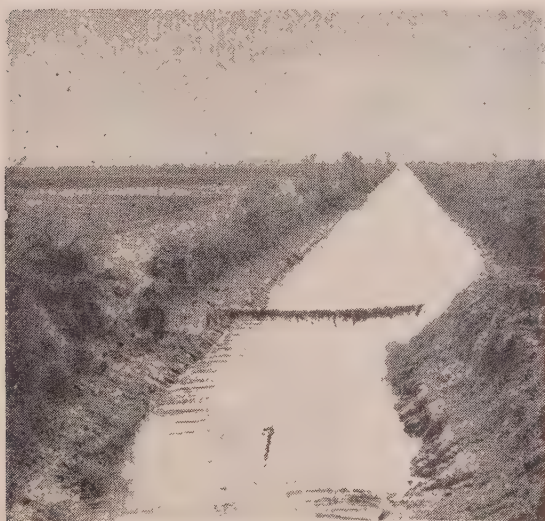


Fig. 7—A main drain through the Moore Park lands at Bundaberg. Improved drainage would appear to be a pre-requisite to successful production in this area.

importations from Louisiana and Natal respectively. The large number of breeding canes imported are, in one way, an embarrassment of riches. It is hardly practicable to exploit to the full the potentialities of all of these canes as



Fig. 8—Q. 58, a Mackay seedling, is growing well on Ingham Line farms in the Invicta Mill area.

establishment in the sugar world. Initially it was established so that resistance trials against our many and varied cane diseases could be conducted without danger to commercial crops. But it is also fulfilling a new function as a living museum of minor and major cane diseases and is a happy hunting ground for visiting pathologists from other countries. All new cane varieties which show promise in any district of becoming commercial canes are tested on this property for resistance or susceptibility to Fiji, downy mildew, leaf scald, red rot, gumming, and ratoon stunting diseases. This procedure gives each commercial cane a pathology record which can be of incalculable value in the event of a sudden disease outbreak.

The Agricultural Aeroplane

It has taken a long time for the "air-borne implement" to show its value in the Queensland sugar belt. The few trials with aerially spread fertilizer have not, so far, led to commer-

cialization of the method, but in the past year some vine control work was successfully conducted on extensive acreages of advanced cane. The effect of the weedicide used was apparent on small weeds in the inter-rows as well as on the climbing vines, and an extension of this method seems likely, particularly in high rainfall areas where wet soils impede tractor work.

The Cane-Grub Danger

Complacency and false economy become closely related when growers in vulnerable areas fail to protect their crops against grey-back grub invasions. Despite continued warnings that beetle flights are not likely to cease because of a decade of use of BHC there are too many growers who feel that a period of successful usage justifies the risk of leaving crops unprotected for a year or so. The 1957 experience, following heavy beetle flights in some areas late in 1956, should act as a salutary reminder that insurance is not effective if premiums are not paid regularly. Any

attempt to reduce production costs should not, in a grub area at least, include savings on BHC.

THE SUGAR EXPERIMENT STATIONS BOARD

Meetings of the full Board were held on 26th and 27th September, 1956, 5th December, 1956, and 6th and 7th March in Brisbane, and 22nd May, 1957, at Ayr.

Experiment Stations were visited by Board members during the year, and the Board was represented by the Chairman or by industry members at all four field days. Since the three-year term of the Board terminated on 30th June, 1957, it was necessary for the Queensland Cane Growers' Council and the Australian Sugar Producers Association to nominate the industry representatives for the ensuing term; both retiring Board members were re-nominated.

During the 1956-57 year the Brisbane City Council gave site approval for the Bureau's proposed new headquarters building on Gregory Terrace, and the Board's architects prepared plans of the building to be erected. It is anticipated that tenders for the construction will be called late in 1957. Emphasis has been placed, in the design, on modern research laboratories for soils, plant pathology, and sugar technology, and the building will, in addition, provide for the Bureau's administrative staff.

The year also witnessed the completion and occupation of the new building on Mackay Sugar Experiment Station which includes, as a new service to the local canegrowing community, a well-equipped soils laboratory.

The Board found it necessary, after two years' dependence on a low levy, to increase the assessment on each ton of cane crushed.

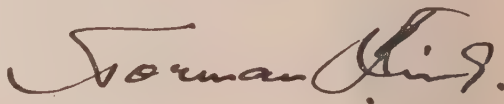
It is essential that the Bureau's activities and services to the industry maintain pace with the enlargement of the sugar producing acreage, and this necessitates an increase in technical staff for investigational and extension work. The encroachment of assignments on to marginal lands has raised several agronomic problems which call for some concentration of effort in those areas.

Following several sectional requests for investigation of specific phases of the cane-payment sampling and analysis procedure the Board, after consultation with the Central Sugar Cane Prices Board, agreed to a wide scale examination of the procedures involved in cane payment. This project is to begin in the 1957 season and will be a continuing one for such time as is required to assess the precision of the existing methods and to examine any which may result in an improvement.

The Board gave consideration, at various times, to the potential danger of giant sensitive plant, and favoured certain amending legislation aimed at giving powers to Cane Pest and Disease Control Boards to expend funds on control of the pest on assigned lands.

In furtherance of its policy of improving the extension services of the Bureau, the Board approved of the appointment of three further Gatton College diploma holders. It also approved a senior appointment of a man with wide Queensland and overseas experience to take charge of the Bureau's agronomic research.

Yours faithfully,



Director.

APPENDIX I.

"The Sugar Experiment Stations Acts, 1900 to 1954"

Statement of Receipts and Disbursements of Funds of the Sugar Experiment Stations Board
for period 1st July, 1956, to 30th June, 1957.

Receipts			DISBURSEMENTS		
	£	s. d.			
Assessment	112,283	15 0	Bank Overdraft (1/7/56)	4,839	9 9
Government Subsidy	7,000	0 0	Salaries	83,678	13 3
Ayr	5,469	10 1	General	44,372	11 10
Bundaberg	3,710	19 5	Ayr	6,385	9 1
Mackay	2,678	3 9	Bundaberg	8,215	2 0
Meringa	1,943	1 10	Mackay	22,022	13 10
Sales of Investment	29,300	17 6	Meringa	16,356	9 11
Sundries	8,314	9 4			
Bank Overdraft (30/6/57)	15,169	12 9			
	<u>£185,870</u>	<u>9 8</u>		<u>£185,870</u>	<u>9 8</u>

Appendix II

C.C.S Formula

$$\text{C.c.s. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.c.s. is calculated by the empirical formula —

$$\text{C.c.s.} = \frac{3P}{2} \left(1 - \frac{5+F}{100} \right) - \frac{B}{2} \left(1 - \frac{3+F}{100} \right)$$

where —

P = pol per cent. first expressed juice.
B = brix per cent. first expressed juice.
F = fibre per cent. cane.

Sugar Values, 1956 Season

The final prices for the 1956 Season's sugar have been declared as follows:—

	No. 1 Pool			No. 2 Pool	Total
	Home Consumption	Surplus	Total	Excess	
Tons	497,767	605,428	1,103,195	68,314	1,171,509
Per cent.	45.1205	54.8795	100	—	—
Price	£53 11 6	£41 15 0	£47 1 9	£37 10 0	£46 10 6

In addition the value for New South Wales production was:—

	Home Consumption	Surplus	Total
Tons	33,431	2,473	35,904
Per cent.	93.1122	6.8878	100
Price	£53 11 6	£41 15 0	£52 15 3

Table I
Sugar Cane Harvested, 1956 — Estimated, 1957

Domestic Tonnages	Actual Tonnages		Mills	Estimated, 1957 (May estimate)
	Accepted	Condemned		
211,632	211,632	117	Mossman	257,545
271,153	271,153	318	Hambleton	336,000
332,004	332,004	151	Mulgrave	360,000
247,336	247,336	—	Babinda	364,000
230,565	230,565	307	Goondi	295,000
228,597	228,597	74	Mourilyan	264,000
311,112	311,112	—	South Johnstone	410,000
342,653	342,653	8	Tully	412,754
649,290	653,736	2,575	Victoria	699,800
366,354	368,263	652	Macknade	392,000
3,190,696	3,197,051	4,202		3,791,099
215,675	209,264	283	Invicta	235,000
333,371	333,371	48	Pioneer	380,000
352,757	352,757	136	Kalamia	383,000
408,441	408,497	70	Inkerman	450,000
1,310,244	1,303,889	537		1,448,000
325,243	325,243	217	Proserpine	360,000
344,850	344,875	71	Farleigh	362,000
370,560	370,486	865	Racecourse	380,000
339,365	339,485	102	Pleystowe	360,000
331,337	331,270	259	Marian	342,000
183,736	183,732	155	Cattle Creek	160,000
224,558	224,558	70	North Eton	200,000
342,370	342,370	135	Plane Creek	350,000
2,462,019	2,462,019	1,874		2,514,000
316,514	316,534	14	Fairymead	260,000
174,028	174,021	0	Qunaba	60,000
351,849	351,836	27	Millaquin	150,000
359,205	359,211	114	Bingera	180,000
134,056	134,050	76	Gin Gin	40,000
342,876	342,876	27	Isis	220,000
160,703	160,703	25	Maryborough	60,000
146,296	146,296	—	Moreton	115,000
29,595	29,595	—	Rocky Point	25,000
2,015,122	2,015,122	283		1,110,000
8,978,081	8,978,081	6,896		8,863,099

Table II
Sugar Production (94 Net Titre), 1951-1956

Districts	1951	1952	1953	1954	1955	1956
North of Townsville	304,786	421,921	467,716	502,276	413,853	406,172
South of Townsville	399,556	512,693	752,667	789,969	721,822	765,698
Totals*	704,342	934,614	1,220,383	1,301,245	1,135,675	1,171,870

* Local Sales included.

Table III
Classes of Cane Harvested, 1956

Districts	Plant Cane		Ratoons		Standover		Total Acres
	Acres	%	Acres	%	Acres	%	
Northern	38,470	29.4	92,419	70.6	39	0.0	130,928
Burdekin	19,101	51.4	17,971	48.3	120	0.3	37,192
Mackay	47,848	41.4	67,476	58.4	221	0.2	115,545
Southern	21,941	28.4	50,395	65.2	4,931	6.4	77,267
Whole State	127,360	35.3	228,261	63.2	5,311	1.5	360,932

Table IV
Total and Average Yields by Districts, 1956

Districts	Tons of Cane	Tons Cane per Acre	Tons 94 N.T. Sugar per Acre
Mossman-Ingham	3,190,696	24.37	3.10
Lower Burdekin	1,310,244	35.23	4.99
Proserpine	325,243	18.80	2.40
Mackay	2,136,776	21.75	2.87
Bundaberg-Gin Gin	1,335,652	27.72	3.49
Childers-Maryborough	503,579	23.89	3.08
Nambour-Beenleigh	175,891	21.97	3.03
Whole State	8,978,081	24.87	3.25

Table V
Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre Yields and Quality of Cane, 1947-1956

Year	Acres* Cultivated	Acres Harvested for Milling	Total Yields		Yields per Acre		Tons Cane per ton Sugar
			Cane	Sugar †	Cane	Sugar	
1947	332,516	220,649	4,150,987	571,658	18.81	2.59	7.26
1948	384,213	258,585	6,433,556	910,049	24.88	3.52	7.07
1949	395,660	275,313	6,518,021	897,267	23.67	3.26	7.26
1950	381,545	257,562	6,691,706	879,844	25.98	3.42	7.61
1951	388,348	273,371	5,005,172	704,342	18.31	2.58	7.11
1952	419,834	274,757	6,841,536	934,614	24.90	3.40	7.32
1953	466,484	332,703	8,751,063	1,220,383	26.30	3.67	7.17
1954	486,741	367,640	9,864,305	1,301,245	26.83	3.54	7.58
1955	482,145	365,252	8,616,163	1,135,675	23.59	3.11	7.59
1956	—	360,932	8,978,081	1,171,870	24.87	3.25	7.66
Averages	—	298,678	7,185,060	972,694	24.06	3.26	7.39

* Supplied by Government Statistician. † Includes Local Sales.

Table VI
† Details of Molasses Disposals for Periods 1947-1956

Usage	Tons of Molasses									
	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Distilleries	54,014	119,615	115,376	99,940	79,063	99,410	154,152	153,212	151,349	159,733
Fertilizer	23,276	34,655	49,293	36,446	34,529	47,260	75,781	69,446	70,691	60,841
Stock Feed	34,808	38,349	36,479	36,621	37,151	37,099	36,263	38,046	35,127	36,699
Mill Fuel	9,340	11,003	9,771	15,556	6,327	5,882	1,211	7,140	10,095	9,315
*Ferment	—	2,479	3,561	3,582	2,033	2,532	3,196	2,779	2,727	2,871
Other Purposes	2,047	161	1,204	231	9	151	217	352	1,179	595
Wasted	99	1,099	1,858	325	235	482	1,111	1,544	1,232	341
Totals	123,584	207,361	217,542	192,701	159,347	192,816	271,931	272,519	272,400	270,395

* Prior to 1948, Molasses used for cleaning ferment was included with that shown under heading "Other Purposes."
† Supplied by Government Statistician.

Table A
Summary of production and consumption figures and sugar values for ten years

Year	Total Sugar Production at 94 n.t.*	Total Sugar Exported at 94 n.t.	Average Australian Price	Average Export Price	Average Price No. 1 Pool Sugar	Average Price all Sugar	Total Value
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£
1947.. ..	571,503	95,246	24 0 0	29 12 6	24 16 0	24 18 9	14,251,000
1948.. ..	909,896	440,814	23 1 0	28 2 0	24 17 0	25 9 11	23,198,000
1949.. ..	896,236	431,254	24 6 0	29 7 6	26 9 3	26 14 10	23,967,000
1950.. ..	879,689	395,151	24 11 0	32 16 6	28 4 1	28 5 4	24,866,000
1951.. ..	704,043	154,486	33 14 0	36 15 6	34 7 4	34 7 6	24,201,478
1952.. ..	934,226	471,008	44 3 0	41 2 0	42 14 2	42 12 3	39,809,705
1953.. ..	1,220,025	730,566	47 18 6	39 18 0	43 8 3	42 7 11	51,723,936
1954.. ..	1,300,844	784,451	47 1 0	37 8 0	42 9 11	41 4 7	53,632,714
1955.. ..	1,135,331	624,521	46 18 0	38 11 6	42 14 2	42 6 5	48,048,154
1956.. ..	1,171,509	673,742	53 11 6	41 6 5	47 1 9	46 10 6	54,504,456

* Excluding Local Sales.

Table B
Table of Mill Peaks (Tons of 94 n.t. Sugar)

Mill	1929	1939	1949†	1950†	1952	1953	1954	Best Year's Output
Mossman	14,972	20,000	22,000	22,000	24,000	31,000	31,000	32,102
Hambleton	31,836	36,000	39,600	39,600	41,000	44,000	44,000	52,298
Mulgrave	31,643	36,000	40,100	40,100	40,500	47,500	47,500	49,710
Babinda	31,901	36,000	39,600	39,600	42,500	46,000	46,400	42,070
Goondi	27,034	29,500	32,400	32,400	34,500	38,000	38,000	39,243
Mourilyan	23,630	27,000	29,700	29,700	31,000	34,000	34,000	35,412
South Johnstone ..	30,979	36,000	39,600	39,600	42,500	47,000	47,000	53,542
Tully	30,930	38,000	42,100	42,100	45,000	47,000	47,000	55,140
Victoria	32,221	37,500	43,600	49,100	52,000	78,000	82,000	89,353
Macknade	30,952	34,000	39,900	46,500	48,500	52,000	52,000	54,295
Invicta	11,736	16,000	18,300	19,100	20,500	30,000	30,000	28,538
Pioneer	21,391	26,000	30,100	34,000	35,500	45,000	45,000	59,045
Kalamia	26,053	31,000	35,400	35,600	38,000	48,000	48,000	59,698
Inkerman	*24,207	31,000	36,800	42,000	45,000	55,000	55,000	74,156
Proserpine	16,650	23,000	26,300	33,000	35,000	43,000	43,000	53,323
Farleigh	16,993	23,000	27,600	32,400	33,500	42,000	42,000	52,499
Racecourse	18,066	24,000	29,000	35,200	36,500	42,000	42,000	51,817
Pleystowe	19,871	24,000	29,200	35,900	37,000	45,000	45,000	52,922
Marian	18,997	24,000	28,600	32,300	33,500	42,000	42,000	47,981
Cattle Creek	8,791	12,000	13,400	14,100	14,500	20,000	20,000	24,272
North Eton	9,319	12,000	14,500	15,900	17,500	26,000	26,000	31,511
Plane Creek	18,233	24,000	28,600	30,800	32,500	42,000	42,000	53,531
Fairymead	15,882	21,000	25,700	28,600	29,500	37,000	37,500	37,877
Qunaba	8,940	10,000	11,200	12,700	13,500	15,500	\$16,500	22,396
Millaquin	14,443	19,000	24,100	29,600	31,000	35,000	\$39,000	46,886
Bingera	17,864	23,000	27,800	31,000	31,500	37,000	37,000	45,087
Gin Gin	6,000	6,500	8,000	8,400	9,000	12,500	13,000	15,966
Isis	28,011	27,000	30,000	30,200	31,500	33,000	35,000	43,714
Maryborough	3,862	7,500	9,500	9,500	†17,300	14,500	20,000	21,314
Mount Bauple	6,231	6,500	7,200	7,200	—	—	—	—
Moreton	11,586	14,000	16,000	16,000	16,500	20,000	20,000	20,520
Eagleby	280	300	—	—	—	—	—	—
Rocky Point	2,014	2,200	2,700	2,700	2,780	3,500	4,000	3,700
	611,428	737,000	848,600	916,900	963,080	1,152,500	1,170,900	—

* Increased by 2,500 tons in 1938.

† Does not include 3 per cent. for Soldiers' Settlement.

‡ Includes 4,800 tons for Mt. Bauple.

§ As from 1955 season 2,000 tons peak was transferred from:
Millaquin to Qunaba.



Fig. 9—Pre-emergence trials with a range of weedicides at Meringa Sugar Experiment Station.

Division of Soils and Agronomy

(L. G. Vallance, Assistant Director)

SOILS AND FERTILIZERS

Urea versus Sulphate of Ammonia

A series of trials in which urea was compared with sulphate of ammonia for top dressing was completed during the year. These experiments were prompted by the fact that urea was available at a cheaper cost per unit of nitrogen than sulphate of ammonia. The tests were carried out on fields of plant and ratoon cane in the major sugar producing districts (Gordonvale, Burdekin, Mackay, and Bundaberg). Both fertilizers brought about the normal response in the various crops, but there were no differences between them in their effect on yields, either in cane or sugar, at the two levels (46 and 92 lb. nitrogen per acre), at which they were used.

In addition storage tests were carried out and it was found that the urea, which was in the prilled form, kept equally as well as sulphate of ammonia. The physical condition remained excellent, and no difficulties should be encountered in the field application of this material.

It has therefore been possible to issue general recommendations for the substitution of urea for sulphate of ammonia. These recommendations are, of course, dependent upon the former being available at a lower unit cost than the latter.

Heavy Fertilizing can be Uneconomical

The plant crop of a fertilizer trial now in its second cycle was harvested at Innisfail. This is the fourth crop from this experiment for which yield figures have been recorded. The results are of interest since they demonstrate the necessity, from the point of view of production costs, to avoid applying heavy amounts of fertilizer to soils already well supplied with plant nutrients. Several treatments were used, varying from four to eight cwt. of mixture combined with top dressings of two and four cwt. of sulphate of ammonia per acre.

The heavier applications have not induced any additional benefit in yields over those produced by the lighter treatments in any of the four crops harvested. The four cwt. applications of mixture plus top dressing have given, by far, the most economical returns.

Phosphate Build-up in a Mackay Soil

It has been frequently remarked in previous Annual Reports that the available phosphate content of many sugar cane soils has increased over the years. This has been due to previous fertilizer practices when mixtures high in phosphate were predominantly used. Since many of these soils were originally quite low in this plant food a very good reason existed in the past for the adoption of such methods. For some time now, Bureau advisory services have been advocating corrective measures, particularly as there is a great deal of evidence to indicate that the increase in phosphate is at the expense of the soil potash content. Therefore, the results of a phosphate trial, the third crop of which was harvested during the year, are of immediate interest.

The experiment was carried out on Mackay Experiment Station on an area that had been regularly fertilized, and where the soil phosphate had increased beyond the level (60 p.p.m.) at which a response to superphosphate is usually obtained. Various levels of both superphosphate and finely-ground rock phosphate were used, singly as well as in combination. The trial commenced on the first ratoon crop and is now in its second planting cycle, the plant crop of which was recently harvested. No differences were obtained in any of these three crops between the phosphate and no phosphate treatments. The former averaged 24.3 tons of cane per acre per crop while the corresponding figure for the latter treatment was 24.2. For sugar, both treatments produced the same mean yields, i.e., 4.3 tons sugar per acre per crop, and at no stage were any significant differences recorded. As might be expected under the circumstances there were no differences between the superphosphate and rock phosphate treatments.

MINOR ELEMENTS

Copper Deficiencies not Extending

The spectacular responses to copper on some of the poorer soils in the Bundaberg and Mackay districts suggested a closer look at other soils which were generally associated with mediocre yields in the former area. Although these fields did not show the droopy top and leaf symptoms which are now regarded as characteristic of copper deficiency it was considered possible that the retarded growth might be due to the lack of this element. However, several observation trials failed to show any responses to copper applied either as the sulphate or as a chelated spray, and it seems unlikely that any such deficiency exists at present in these locations.

A quantitative trial was also harvested from a soil at Gooburrum where a preliminary application had indicated the possibility of a slight response to copper. However, the yields from the plots receiving various amounts of copper sulphate showed no increase in either cane or sugar.

Unfortunately, the severe drought conditions which prevailed in the southern districts interfered with several of the trials and these will be repeated.

Response to Iron Spray

A noticeable feature of many young ratoon fields in North Queensland for many years has been the presence of yellow patches of cane in an otherwise normal field. These usually occur in the early spring as the new ratoon shoots commence to make growth. They may persist for a period of several weeks, and then suddenly disappear. Frequently, this yellowing, followed by a return to normal colour, gives the impression of moving from one part of the field to another. Because of its chimerical nature it is difficult to determine whether any loss in crop is associated. In any cane, any growth decrease is not obvious except perhaps on some of the more sandy or gravelly ridges. It is not confined to any one soil type and is sometimes seen in plant cane.

During the year the occurrences were rather more prevalent than usual and some investigation seemed warranted. It had long been suspected that the symptoms were due to a temporary restriction in the uptake of iron by the young plant and such proved to be the case. Spraying with a weak solution of ferrous sulphate corrected the condition and a rapid return to normal colour took place within a day or two.

WEED CONTROL

Dalapon Promises Control of Reed

For many years, growers in several areas have had difficulty in controlling the common reed (*Phragmites communis*) on the lower lying portions of their properties. Many weedicides and cultivation methods have been used with only partial success.

During the spring and early summer of 1956, areas of reed at Ayr and Nambour were sprayed with Dalapon at the rates of 30 lb. and 15 lb. per acre. The control exerted by the heavier application was excellent and some six months later there was no indication of re-growth of any consequence. The very few weak and malformed shoots which have appeared seem unlikely to become established. The 15 lb. application, though slower, is also giving evidence of effective control.

Successful Aerial Spraying of Vine Weeds

The application of 2,4-D from the air has proved most effective for the control of such vine weeds as *Convolvulus* and *Star of Bethlehem*. Field observations made over several hundred acres of cane in the Burdekin, Giru, and Ingham areas reveal that a very good kill was obtained even in standing cane five to six feet in height. Dosages of one pound of 2,4-D sodium salt in five gallons of water per acre were successfully used at Ingham, while at Ayr a little over twice these amounts was applied.

P.c.p. Effective Against Giant Sensitive Plant

A number of trials were carried out to determine the suitability of various weedicides

for the control of giant sensitive weed (*Mimosa invisa*) in cane fields. It was found that most pentachlorophenol derivatives were very effective and produced a much more rapid kill than the various salts of 2,4-D. Arsenical weedicides were also tried, but although the weed was easily killed by dilute solutions, the cane was adversely affected. Some slight burning of the cane leaf occurred with pentachlorophenol, but the crop quickly recovered. Sodium pentachlorophenate at two to three pounds per acre in 100 gallons of water provided a safe and economical means of controlling the weed in its early stages in fields of young cane.

2,4-D and M.C.P.A. Decomposed by Soil Organisms

Using a technique involving the use of cucumber seedlings, it has been shown that in the laboratory and in the field, phenoxyacetic acid type weedicide is readily decomposed in the



Fig. 10—Soil erosion on a red soil farm at Innisfail.

soil. The rate of decomposition, which varied with soil type, was found to proceed approximately four times as fast in a soil that had previously been treated with the weedicide in question than in a similar untreated soil. The antagonistic bacterial population in the soil,

which apparently built up after the use of such materials, was found to destroy the potency of 2,4-D and M.C.P.A. even though the soil had been stored dry for 70 days. It was observed that 2,4-D was decomposed twice as fast as M.C.P.A.

In a replicated field experiment C.M.U., 2,4-D, 2,4,5-T, and M.C.P.A. were tested as pre-emergence weedicides. Various formulations of C.M.U. at 4 lb. per acre were found to give excellent control of weeds and grasses for up to six weeks, and fair control up to ten weeks. C.M.U. at 2 lb. per acre and M.C.P.A. at 4 lb. per acre also showed promise.

Four pound per acre applications of 2,4-D and 2,4,5-T were found to be far less effective. Tests of the soil using the cucumber seedling method showed that the 2,4-D was rendered ineffective after 13 days and the M.C.P.A. in 20 days. The rate of decomposition of the C.M.U. is unknown as the cucumber seedling technique is not applicable to this material.

SOIL CONSERVATION

An increasing number of growers in the Childers, Maroondan, and Maryborough areas are showing an interest in soil conservation, and the Bureau, which has recently taken over this work from the Queensland Department of Agriculture, has commenced work in surveying and designing suitable control measures for 77 acres of cane land in these areas. While contouring introduces difficulties associated with point rows, contour bank maintenance and the laying of tramlines, many growers now realise the benefits derived outweigh the disadvantages and propose to introduce measures to control erosion. In cases where farmers are following the "Keyline" and "Guideline" principles, which eliminate the use of contour banks, a watch is being kept to see if such control measures are more suited to cane growing than the more conventional approach to the problem of hillside cultivation.

CANE DETERIORATION STUDIES

A trial was conducted with six varieties to determine varietal deterioration after harvest.

After 14 days Badila was found to retain 85 per cent. of its original c.c.s. while K.641 retained only 30 per cent. All varieties other than Q.57 decreased in c.c.s. during the first five days after harvest; however, inversion of the sucrose in this variety set in rapidly after this period and the c.c.s. fell to a very low figure at 14 days.

Effect of Maleic Hydrazide on Deterioration

A four per cent. solution of maleic hydrazide was sprayed on the leaves of cane six weeks prior to harvesting to test the effect of this material on post-harvest loss of c.c.s. It was found that maleic hydrazide slowed down the loss of c.c.s., particularly from the top portion of the stalk. After 14 days treated cane retained 50 per cent. of the c.c.s. at harvest compared with 35.5 per cent. retained by the untreated cane.

IRRIGATION INVESTIGATIONS

Infiltration Measurements

A continuation of the infiltration measurements, using ring infiltrometers, indicated that, in all soils tested, the initial rate is high and irregular but at a later stage slows down and tends to assume a uniform value. Where lime applications were made the differences in infiltration rate became obvious after an hour of irrigation and were more pronounced after longer periods. With two and four tons of lime per acre the permeability was 50 to 100 per cent. greater, although the water quantities involved were relatively small. For example, infiltration in the control areas was 0.2 inches per hour, with two tons of lime 0.4 inches per hour and, with four tons, 0.75 inches per hour.

As the time of application of a stream of water is inversely proportional to the minimum infiltration rate it is possible to indicate with what water flow a given acreage may be irrigated—assuming that the ring infiltrometer is a fair guide to the actual infiltration in furrow irrigation. In a specific case it was found that, for a total application of four inches of



Fig. 11—Clearing Guinea grass with a dozer blade at Home Hill.

water per acre, the control plots would require 20 hours with a stream flow of 0.2 cusec per acre, the two tons lime area 11½ hours at 0.35 cusec, and the four tons lime treatment 8 hours at 0.5 cusec per acre.

Irrigation Water Measurement

The Parshall flume was used in an experiment where the input of irrigation water was compared with soil moisture measurements before and after irrigation. It was found that soil moisture increased from 9.5 to 23.9 per cent. by weight, or that 3.6 inches of water had been applied. This corresponded quite well with the measured amount of 3.45 inches calculated as passing through the Parshall flume.

ANALYTICAL WORK

Fertilizer Recommendations

The fertilizer recommendations made during the year again emphasised the necessity for adequate usage of potash. The number of soil samples received from farmers was 1,318 and 62 per cent. of these were low in potash. The accompanying table records the number of samples received from the various districts and indicates the fertility levels in regard to phosphate and potash. It might again be pointed

out that the Burdekin (Ayr) soils are showing no diminution in their high levels of P and K in spite of the fact that fertilizing is customarily restricted to nitrogenous top-dressings in that area.

Central District Soil Service

Analysis of soil samples was commenced at the new Mackay Laboratory in mid-May, and 102 soils were analysed by the end of June. Appropriate fertilizer recommendations were forwarded to the growers concerned.

Fly-ash Analysis

An investigation was made into the possible uses of the heavy and the light fractions of fly-ash from eliminators recently installed at a southern mill. However, neither fraction contained sufficient nitrogen, phosphoric acid, or potash to be useful as a fertilizer. Although the light fraction contained 20 per cent. carbon it did not possess any significant decolourising properties.

Miscellaneous Items

The remainder of the total of 1,818 samples handled during the year consisted of miscellaneous products from various sections of the industry. It is of interest to record that at Cannonvale, where salt damage was suspected in a block of cane, the soil from the affected area contained up to 0.97 per cent. chloride. As soils with a chloride content greater than 0.1 per cent. must be considered suspect and those with 0.2 per cent. are generally toxic, the poor growth was undoubtedly due to an accumulation of salt.

Some 300 soil samples were taken from a series of trials in progress in several districts and were submitted to examination for available potash. The gamma isomer of benzene hexachloride was determined in several samples of sand-BHC mixtures in use at Ayr for grub control.

Northern Sugar Experiment Station

G. Bates, Senior Adviser

Weather and Crop Notes

Rainfall for the period under review was 76.27 inches, which is close to the average, and the season could be described as an average one. The soil was in good condition for the growing crop at the commencement of the 1956-57 season. Rainfall for July to November inclusive was slightly under average but, except on dry soil and gravel patches, the cane did not show any distress. Rainfall for December was abnormal, amounting to 14.22 inches, nearly three times the usual amount. This rain hampered ratooning operations and the cultivation of young cane so that many weedy fields were in evidence. Early in the year prospects for the 1957 crushing looked bright, although crops were then not as forward as at the same time the previous year. The wet season was an average one and no serious flooding took place. Unlike the wet season of 1956 there was little wind and crops were in good condition at the commencement of the 1957 crushing. Early c.c.s. figures for local mills were higher than

the previous year. Arrowing was both free and early. The wet season ended early, and March and April rainfall was below average, but late rains in May and June seriously interfered with autumn planting.

The following tables show the rainfall records taken at the Northern Sugar Experiment Station over the past 33 years and include details of other meteorological observations:—

Rainfall Records, 1924-1957

Year	Rainfall in inches	Year	Rainfall in inches
1924-25	82.86	1941-42	41.55
1925-26	49.02	1942-43	64.60
1926-27	80.34	1943-44	52.92
1927-28	72.46	1944-45	120.34
1928-29	92.83	1945-46	63.95
1929-30	69.99	1946-47	35.24
1930-31	75.62	1947-48	69.12
1931-32	61.87	1948-49	85.77
1932-33	90.02	1949-50	83.50
1933-34	119.09	1950-51	67.68
1934-35	58.22	1951-52	52.86
1935-36	87.64	1952-53	83.98
1936-37	49.54	1953-54	68.15
1937-38	53.28	1954-55	99.81
1938-39	126.79	1955-56	71.91
1939-49	82.10	1956-57	76.27
1940-41	80.59		

Average Rainfall for 33 years: 74.84 inches.

Abstract of Meteorological Observations made at Northern Sugar Experiment Station, Gordonvale, from 1st July, 1956, to 30th June, 1957.

Month	Rain- fall in Inches	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tem- perature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.	Average Daily Hours Sunshine
			Maximum			Minimum						
			High	Low	Mean	High	Low	Mean				
1956												hr. min.
July	0.61	8	83.5	72	79.2	70	46	59.20	20.00	67.45	86.6	5 31
Aug.	0.77	12	82.5	72	78.48	68	49	60.06	18.42	70.37	83.1	4 56
Sept.	0.37	8	88.5	73	81.71	70	50	61.27	20.44	73.57	73.2	5 47
Oct.	1.12	7	94.5	81.5	88.21	76	58	66.34	21.87	79.63	73.3	6 43
Nov.	2.25	9	100	80	89.45	79	63	69.68	19.77	81.47	71.8	7 47
Dec.	14.22	17	98	86	92.23	78.5	67.5	73.16	19.07	82.95	77.3	6 4
1957												
Jan.	23.17	26	92	80	86.82	76	64	71.44	15.38	79.40	81.9	5 12
Feb.	12.63	17	96.5	81.5	90.71	76	67.5	73.03	17.68	80.71	82.5	6 4
Mar.	10.38	25	94	76	86.75	76	63.5	70.00	16.75	78.27	82.52	4 39
Apr.	2.55	18	89	78	85.68	73	59.5	67.27	18.41	76.02	82.97	6 15
May	3.27	24	88	76	81.17	69	40	62.27	18.90	72.27	79.64	5 20
June	4.93	21	83	72.5	78.57	67	47	61.03	17.54	69.74	86.76	4 49
Totals	76.27	192										



Fig. 12—Mr. B. Foley, Chairman of the Queensland Cane Growers' Council, presents a plaque to the Bureau as an appreciation of research which led to control of the cane grub.

Pests and Diseases

The most important insect pest in far northern districts was the frenchi grub which caused losses of 4,000 tons of cane in the Mulgrave area, 1,200 tons in Mossman, and 840 tons at Hambleton. In all three areas, some fields which had been ploughed out and replanted immediately after being harvested, were badly damaged, but the major loss of cane was in second ratoons. Bureau officers and the Field Supervisors of the Cane Pest and Disease Control Boards advised growers to apply BHC at planting time for the protection of plant crops, and that practice was adopted by a few.

Consobrina grubs did considerable damage at Rocky Point, Mossman, causing the loss of 1,500 tons of cane; they also destroyed 50 tons of cane on two acres of second ratoons, where no BHC had been applied, on a Hambleton farm on the Cook Highway. At Mossman some fields of first ratoons were almost a complete loss where 75 to 90 lb. of 20 per cent. BHC had been

applied on the plant crop, but overall the damage was mitigated by the continuance of good soil moisture into the harvesting period.

Greyback grubs reduced the Babinda crop by 400 tons, attacking fields where no BHC had been used, but that species caused no visible damage in the three more northerly mill areas.

The season was notably free from outbreaks of the minor insect pests, such as armyworms, wireworms, beetle borers, and locusts.

Loss due to rat damage in the 1957 crop was predicted at 3,500 tons at Mossman, 1,210 at Hambleton, 1,500 tons at Mulgrave, and 4,500 tons at Babinda. Wild pigs destroyed 500 tons of cane at Mossman and 300 tons at Hambleton, and were more active than usual at Mulgrave, where no estimate is available.

Unidentified wild fauna did noticeable damage to mature cane near rain forest, and wallabies attacked cane only on a minor scale.

1956 Plantings and Germinations

Early plantings for the 1957 crop were above normal. This was due to rains in April and May, 1956, being lighter than usual, allowing growers to prepare land for early planting. Good germinations were the rule. Later plantings, referred to as "spring plant," also gave good germinations, but the abnormal rain in December caused long delays in cultivation with the result that both plant and ratoon crops became very weedy. Many growers got behind with fertilizer applications and a big percentage of fertilizer was applied much later than usual.

1957 Planting Conditions for 1958 Crop

Rainfall for the 12 months was 76.27 inches compared with the 33-year average of 74.84. Precipitation for the six months January to June, 1957, inclusive was 56.93 inches, slightly below average. The distribution, however, was

abnormal; February, March, and April being much below average, so that growers were able to prepare a large acreage for early planting. However, May and June rains were above average, May having 24 wet days and June 21, so that planting programmes were upset, and growers in wetter areas are much behind with planting. The cane that did get planted germinated slowly, and cane fields became very weedy. This position, coupled with the cultivation problems experienced in December, 1956, has re-awakened interest in chemical weed control which had waned in the last couple of years.

EXPERIMENT STATION OPERATIONS

Seedling Raising and Selection

In conformity with usual practice, fuzz was planted in the glasshouse late in July, and subsequently a grand total of approximately



Fig. 13—On the occasion of the plaque presentation at Meringa Mr. Buzacott's address was listened to by Messrs. A. F. Bell, B. Foley, N. J. King, the Rt. Hon. the Prime Minister of Australia (Mr. R. G. Menzies), Senator Maher, and Senator Courtice.

38,427 seedlings were planted in the field during October. These consisted of 7,067 spaced seedlings and 3,136 bunches.

The field selections during 1955 resulted in 949 seedlings being planted out; 344 went into 30-sett plots, 196 into two-sett plantings, six into five-sett plots, and 63 seedlings were selected for breeding purposes; in addition 195 seedlings from Mackay and 145 from Ayr were planted in two-sett plots. Approximately 1,100 seedlings were transferred to the Babinda sub-station and 1,200 to Innisfail. Details of these selections and plantings are given in the Senior Plant Breeder's report.

Experiments Planted During the Year

The work of the station was somewhat curtailed as an aftermath of the cyclone "Agnes." The two, ratoon, yield-observation trials; one with "M" series seedlings and the

other with "I" and "K" seedlings were not weighed at harvest owing to the cane being so badly damaged; and owing to the difficulty in selection, no randomised plot trial was planted in 1956.

A randomised, yield-observation trial, having four replications of each variety, was planted in 1956. This consisted of 20 varieties plus Pindar as a standard. The varieties were two "L" series seedlings, eight "M" series, two 53 series, six 54 series, together with Q.61 and Q.62.

A yield-observation trial was also planted with the object of testing several varieties against lodging in heavy crops on good land. The varieties were Badila (standard), Q.57, Q.58, Q.67, I.102, I.106, M.336, M.682, M.726, and M.762. All canes made vigorous growth and at the end of March all lodged with the exception of Q.57, Q.67, and M.336. By the end of



Fig. 14—Planting selected seedlings on a block on Meringa Experiment Station.



Fig. 15—On the right side of the photograph, behind the figure, is Q.67. This seedling, raised at the Lower Burdekin, has strong anti-lodging characteristics.

April the only variety standing was Q.67 and it has remained erect. Q.67 is a cross between Trojan and Q.27, and shows promise of being a valuable cane on good land. Although considered a slow germinator, its sugar content is good.

Experiments Harvested During the Year

Owing to cyclone damage only two seedling trials were harvested during the year. These consisted of a plant, randomised, yield-observation trial and the other a ratoon latin square. The yield-observation trial consisted of 19 "N" series seedlings, H.35-198, H.40-1184, H.44-2364, C.P. 43-47, I.106, L.604, and M.605, plus Pindar as a standard. After taking into consideration the cyclone damage suffered by Pindar, results indicated that no variety was superior to the standard. The trial will be evaluated again in the ratoon crop.

In the ratoon latin square trial with "K" varieties the results were affected by the decapitation of the standard variety Pindar. This shot from the three top eyes and made a new canopy



Fig. 16—The variety Q.58 growing on Meringa Station.

and, at time of harvest, the sugar content was satisfactory; but seven or eight tons per acre had been lost in growth.

Yields per acre were:—

	Cane	Sugar
K.690 ..	33.47 tons	4.75 tons
K.675 ..	29.85 „	4.48 „
K.646 ..	28.5 „	4.00 „
Pindar ..	27.81 „	4.25 „
K.728 ..	27.42 „	4.32 „

New Varieties Imported

Thirty-one new varieties were introduced to this station during 1956 for cross pollination work and trial as commercial canes. These were: Fotiogo, Malaquele No. 23, Tabongo, B.4362, 41R.2070, H.32-6774, H.36-1804,

H.37-6819, H.39-3633, H.39-7028, H.44-2818, H.44-3098, H.45-369, H.45-2120, H.45-7708, H.48-3432, H.54-6195, H.54-6233, H.54-6359, H.54-6372, M.129-43, M.147-44, M.311-41, N.Co. 376, N.Co.382, 28N.G.219, C.L.41-70, C.P.44-154, C.P.45-184, C.P.47-193, C.P.50-56.

Legumes

A trial involving 19 varieties of velvet bean was planted to compare these varieties with the standard. The late growth of most varieties, including the standard, was poor. This was probably due to the incidence of *Cercospora* leaf spot. However, two varieties, Velvet Mottled and Crew provided good late growth and appear to have some resistance to the leaf spot. Two others, Velvet 34 and Deeringianum, have also been selected, making four to be planted in further trials.



Fig. 17—The last stages of a yield with new varieties; samples being assembled for juice analysis.



Fig. 18—Field Day visitors at Meringa listening to an address by the Director.

out late in the season, with the variety Trojan, planting taking place on 4th November. It is felt that perhaps results may have been different had the trial been planted in the winter months.

The two time/temperature trials, one of first ratoon and one of plant cane, were examined, and results indicate that three hours at 50°C. is necessary for complete control. This has been the standard treatment at this station for the past two years. During the last year a further 60 varieties were hot-water treated. All plantings made on the station during the last twelve months have been made from three hours treated stocks.

Presentation of Plaque

On April 6th, 1957, in the presence of 150 visitors including the Right Honourable the Prime Minister of Australia (Mr. R. G. Menzies), the Chairman of the Queensland Cane Growers' Council, Mr. B. Foley, presented a

plaque to the Sugar Experiment Stations, which was received by Mr. A. F. Bell, Deputy Chairman of the Sugar Experiment Stations Board. The plaque is erected on a triangular granite slab in the Meringa garden and the inscription reads:

"This plaque was presented by the Queensland Cane Growers' Council in recognition of the major service performed by the Bureau of Sugar Experiment Stations to the cane growers of Queensland in initiating and carrying to fruition the research which led to the successful control of the cane grub, the industry's worst pest."

Breeding Cane Collection

The variety garden was maintained and there are now 509 varieties on the station exclusive of approximately 38,427 original seedlings and 949 other seedlings under test.

Ratoon Stunting Disease Investigations

One hot-water treatment trial was set out. The trial consisted of delaying of treatment after cutting, for up to nine days. Although treatments carried out three and four days after cutting gave the best germinations, they were not significantly better than treatments carried out after a shorter delay in treatment. They were, however, significantly better than germinations of treatments carried out six or more days after cutting. This trial was carried

General

During the past twelve months a little more land has been brought under cultivation and the purchase of a heavy tractor has greatly helped in the efficient cultivation of land.

A red rot disease resistance trial was planted on Division E6 using the following varieties: Trojan, Pindar, Q.52, Q.58, Q.59, Co.270, Co.290, Co.475, Mowbray Seedling No. 3, P.O.J.213, and D.1-52.

Laboratory Work

The following is a summary of cane samples handled during the year:—

Station and trial samples ..	1,016
Farmers' samples	73
	1,089

Summary of Crops Grown on the Station—

Parent canes, and trials ..	458.585
Original seedlings	59.125
	517.710
Plant cane harvested for the mill	248.155
Ratoon cane harvested for the mill	239.555
Used for plants, samples, etc. ..	30.00
	517.710
Area plant cane harvested ..	11.9 acres
Area ratoon cane harvested ..	9.4 acres
Average tons per acre ..	24.3

Lower Burdekin Sugar Experiment Station

G. A. Christie, Officer in Charge

Weather Conditions, July, 1956, to June, 1957

The normal rainfall pattern of the Burdekin area shows very little precipitation outside the months of January, February, and March when a very high proportion of the annual rain is recorded. The period under review, however, gave a little less than the total annual average rain, but only 60 per cent. of this fell in the three months of the usual monsoonal period. Useful winter rains were recorded in 1956, while storms in the late spring and early summer lessened the amount of irrigation water normally applied to crops in this period. January to mid-March produced frequent showers, occurring mainly at night and with ample sunlight, adequate moisture and high temperatures excellent growth conditions for crops resulted. An important feature was the complete absence of any strong winds during the period of rapid growth, and at the commencement of harvest practically all crops were standing erect.

Due to a prolonged wet season in the first half of 1956, much of the planting of the 1957 crop

was delayed until winter and spring, but with the favourable conditions for subsequent growth, crops produced from this later planting are expected to compare favourably with those of normal years.

Fine weather from the middle of March onward allowed early soil preparation and planting of cane for the 1958 harvest, but germination in many cases was slowed by very cool weather occurring in the latter half of May.

While weather conditions were highly satisfactory for the growth of cane for 1957 harvest, showers and storms in the latter half of 1956 caused some interruptions in the 1956 harvest period by reason of wet fields preventing the hauling of cane and because of inability to obtain successful pre-harvest burns.

An abstract of meteorological observations at this Station for the period 1st July, 1956, to 30th June, 1957, is attached.

Ratoon Stunting Disease

Pursuing the policy of providing hot-water treated planting material for use on farms in the Lower Burdekin and Giru areas, Cane Pest and Disease Control Boards were active in establishing and distributing from plots plants which were treated for three hours at 50°C. This Station also assisted in the project by making available approximately 100 tons of disease-free cane for planting on district farms. In the Giru area the material served a dual

Fig. 19—The office surroundings at the Experiment Station. The glasshouse and seedling tables are on the extreme right.



purpose on some farms where chlorotic streak had been found, in providing a nucleus of plants free from both diseases. Cane growers continue to report superior germination and early growth from treated plants, and such results ensure their co-operation in the campaign for the control of ratoon stunting disease.

Chlorotic Streak Disease

After this disease was found in the Giru area in June, 1956, a survey to determine the extent of infection in this district was undertaken; this resulted in symptoms being located on 17 farms. Steps were taken immediately to control the use of planting material on diseased farms to limit the further spread of the disease in the area.

Disease symptoms were found mainly in the variety Trojan which comprises a fairly large proportion of the total crop.

Other Diseases

A disease of unknown origin affecting the varieties Q.57 and Pindar, on at least ten farms in the area, has been under examination by pathologists during the last year. Stunted growth in patches has resulted in minor crop losses, and a study of the condition aims at devising control measures before it assumes any importance in the area. Specimens of other cane abnormalities located during the year were submitted for pathological investigation. No mosaic disease was found in the period under review in the Lower Burdekin or Giru areas, though the area inspected was reduced due to weather conditions and to greater emphasis being placed on the control of other diseases. Germination of young cane in the cool weather of May and June was slow and the resultant strikes produced incomplete stands. With the almost universal use of fungicidal solutions for treating setts, the



Fig. 20—An aerial view of the Station, showing buildings and field plots. Note checker-board layout of field experiments.



Fig. 21—*The effect of ratoon stunting disease on S.J.16. The middle two rows are diseased cane, and the remainder are from hot-water treated plants.*

many plants examined showed no signs of pineapple disease in areas where many “misses” had occurred.

Entomological Notes

Weather conditions during the summer months were ideal for the survival of greyback cane grubs following comparatively heavy flights of beetles in many parts of the Burdekin and Giru areas. Damage to crops on the southern side of the Burdekin River and in the Giru district was confined to fields which had not been treated with BHC. In the Ayr district, however, damage was widespread on both treated and untreated fields, and after an investigation by the Senior Entomologist, certain recommendations were made to the Board; if they are adopted, a repetition of this year's losses should not occur. Direct losses from greyback grubs in this area are estimated at over 15,000 tons of cane.

Minor losses from termites were noted, the damage being less than in years when rainfall is poorly distributed.

Other Pests

Wallabies were numerous, but with a plentiful supply of natural grasses in grazing land on

the perimeter of the cane area, they caused very little damage to cane crops. Rat damage was very light in crops for 1957 harvest, while coots caused minor losses in areas adjacent to lagoons and water courses.

Legume Crops

The area planted to legumes has increased slowly over the last few years, velvet bean being the crop used in practically every case. Excellent stands are produced and the dense mass frequently presents some mechanical difficulty when being ploughed or disc harrowed into the soil. The subsequent improvement in the physical condition of the soil following a green manure crop is generally recognised by cane growers, but observations on a trial using different levels of nitrogenous fertilizer following a heavy legume crop suggest that the nitrogen content of a bean crop may not be fully available to the following cane crop. A trial planting of ten new varieties of velvet bean, with the variety used in district plantings as standard, was planted on this Station in December, 1956. Some of the new varieties showed moderate leaf spotting and all were inferior in growth to the standard.

Varietal Position

Following breakage of the tops of the variety Pindar in the cyclone of 1956, the area planted to the variety in that year was considerably reduced. In 1957 planting, however, the demand for Pindar plants returned to that of previous years, and this variety will continue to take second place to Trojan in tonnages supplied for milling. Badila, which until 12 or 15 years ago constituted over 50 per cent. of the crop, dropped gradually in the intervening years to a minor place. Since hot water treated planting material has become available, requests for plants of this variety have increased, but since good results are expected only on highly fertile soils, it is not anticipated that the variety will return to its former prominence.

A new seedling Q.67 (Trojan x Q.27) has passed through Station and district trials successfully and may in the near future be released for district planting. It is of interest to record that this variety was among the first batch of seedlings ever produced in the Lower Burdekin when this Station commenced operations in 1950. While its yield of cane per acre may be slightly inferior to some standard varieties, its comparatively high early sugar content, resistance to lodging and many favourable agricultural characteristics may find it a place in the varieties of the district, particularly on soils of high fertility.

WORK ON THE EXPERIMENT STATION

Seedling Raising

The production and testing of seedlings continues to play an important part in the activities of this Station. Cane fuzz received from the Northern Sugar Experiment Station was planted in the Station's glasshouse on 2nd August, 1956, when a fairly satisfactory germination was obtained. Some seedlings died in the seed boxes following the development of an unidentified fungus, but ample remained to permit the planting of 6,384 in the field, these being the progeny of 42 bi-parental combinations. When examined in June, 1957, 136 seedlings were selected for

inclusion in further trial plantings. A large proportion of the selected varieties were produced from crosses, the female parent of which was Trojan, while a high selection rate was obtained from G.362 x M.336, only a comparatively small number of this family being represented in the field.

Advanced Seedling Trials

One hundred and ninety-seven new varieties, consisting of 148 of this Station's seedlings and 49 varieties brought here from other districts or other countries, were planted in August, 1956, in small plots for comparisons with standard varieties. 22 of these proved worthy of inclusion in a replicated yield trial when selected in June, 1957.



Fig. 22—Delegates to the Annual Conference of Cane Pest and Disease Control Boards examine a BHC distributor.

Maturity testing, yield results of the plant yield-observation trial of 26 varieties planted in 1955, and the subsequent growth of the first ratoon crop indicated that none of the new canes gave outstanding results. In the plant crop, Vidar, which with 9.49 tons of sugar per acre led the field of new varieties, was inferior to Trojan (10.04 tons of sugar per acre), while the cyclone-damaged Pindar in the same trial gave 7.26 tons of sugar per acre. After the harvest of the ratoon crop, the varieties will receive further consideration to determine which ones, if any, warrant inclusion in future trial plantings.

The four seedlings canes (N.434, N.435, N.446, and N.449), which were planted in a randomised

block trial in August, 1956, show no outstanding features when compared with standard varieties, and their value will be assessed from maturity tests and varietal yields.

In the plant crop of the randomised block trial, harvested in October, 1956, one of the standards, Trojan, was superior to all varieties in tons of cane and tons of sugar produced per acre. It was closely followed by M.421, while other seedlings under trial gave lower returns. The crop produced by Pindar was poor due to cyclone damage. Yield figures for all varieties are as follows:—

Variety	Tons cane per acre		Tons sugar per acre	
		c.c.s.		
Trojan	..	49.18	17.68	8.70
M.421	..	44.39	17.89	7.93
M.456	..	37.55	17.50	6.57
M.415	..	37.14	17.36	6.43
M.441	..	40.15	16.04	6.42
Pindar	..	32.24	17.86	5.76

The growth of M.421 has been rather poor in the ratoon crop which will be harvested in 1957, but in view of the satisfactory results in the plant crop, observation plots have been established on a number of district farms to determine its suitability in different parts of the area.

A number of thin vigorous varieties, introduced to this area from the Central and Southern Sugar Experiment Stations, were planted on district farms where irrigation is not practised or where soils of lower productivity occur, and the first year's comparison with standards indicates that some may be grown with better results than the existing varieties. Further trial plantings on an increased number of farms will be made, for the dual purpose of increasing stocks of the varieties and for comparison with standard canes of the area.

Isolation Plot

Precautions aimed at preventing the introduction of diseases into this area were



Fig. 23—The new variety Q.67 standing erect in the background while Trojan in the foreground has lodged. The great height of the crop is demonstrated by the size of the man's figure circled in white.

continued with the planting of 15 varieties received from the Northern Sugar Experiment Station in a plot at Millaroo, situated approximately 30 miles from the nearest commercial cane area. Setts were hot water treated (50°C. for three hours) before being planted, and regular inspections through the year showed no symptoms of any disease. The varieties will be included in 40-sett plots to assess their suitability for this district.

BHC Toxicity Trial

This trial, established in 1952, aims at determining whether any toxic effect on crops can be detected following the use of either crude or refined BHC. Applications of each product at different levels have been made and, in 1956 when the plant crop of the second cycle was harvested, some crop differences were recorded, but the statistical analysis of yields indicated that no significant differences in tons of sugar produced per acre had occurred. At ratooning, plots were re-treated with the insecticide and at the present time the trial shows no visible differences in crop growth.

Ratooning Investigations

A qualitative trial to study the decreasing yields from ratoon crops was established in 1956 using the varieties Q.57, Pindar, and

Trojan. A successful plant crop was produced in the trial area, and ratoon crops will receive normal treatment to provide the information required.

A quantitative trial with four replications and three varieties was planted in 1957 to examine the economics of growing of ratoons, and in this trial the comparative yields of plant, first and second ratoon crops will be available under the same seasonal conditions, in a few years time.

Ratoon Stunting Disease Time/Temperature Trial

Thick and thin plants of four standard varieties were hot water treated for different periods over a range of temperatures from 49°C. to 52°C. in 1955 and an examination of the mature cane prior to harvest in 1956 and inspection of young ratoon shoots after harvest, provided information useful in furthering studies in the control of ratoon stunting disease. Control rows in the trial showed satisfactory disease symptoms, and evidence of losses from this disease can be seen in the depressed growth of untreated cane when compared with cane in hot water treated sections.

Field Days

Two Field Days occurred in the period under review, the first on 31st July, 1956, was marred

Abstract of Meteorological Observations at the Lower Burdekin Sugar Experiment Station for the year 1st July, 1956 to 30th June, 1957.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1956											
July	2.27	1	82	66	76.75	64	41	53.63	23.12	64.52	78.33
August .. .	.80	4	86	74	78.67	64	43	52.48	26.19	66.68	73.19
September ..	1.11	2	86	78	80.72	64	48	53.17	27.55	71.04	64.65
October .. .	1.10	4	92	82	86.39	77	56	63.32	23.07	80.29	66.86
November ..	2.71	5	94	78	86.82	75	58	64.96	21.86	81.10	71.14
December ..	4.75	13	96	80	90.91	77	64	71.00	19.91	83.73	71.13
1957											
January .. .	7.62	8	94	84	88.26	77	64	69.58	18.68	71.91	70.12
February ..	6.01	12	96	84	89.36	78	66	72.68	16.68	82.36	75.40
March .. .	7.57	11	88	82	85.09	75	63	68.30	16.79	79.21	74.51
April .. .	—	—	90	84	85.77	73	58	64.12	21.65	78.77	72.38
May .. .	1.14	5	88	72	80.65	64	42	55.81	24.84	71.85	65.77
June .. .	.18	4	80	76	78.09	64	43	53.95	24.14	68.62	73.90
Totals ..	35.26	69									



Fig. 24—The Hon. H. H. Collins, Chairman of the Sugar Experiment Stations Board, addresses growers at the Lower Burdekin Field Day.

by wet weather, while the second, held on 21st May, 1957, was well attended under favourable weather conditions.

Visitors were particularly interested in inspecting seedlings in their various stages of trial, and were shown many items of interest on this Experiment Station. Addresses by members of the Sugar Experiment Stations Board and the Director found a keen audience.

Laboratory Work

Seven hundred and forty-one cane samples were analysed during the year comprising:—

Experiment Station and Farm Trial				
Samples	..	..	..	707
Investigating cyclone damage	..	..	..	16
Growers' Samples	..	..	..	18

In addition, a large number of soil moisture tests were conducted in furthering irrigation studies and this is dealt with more fully elsewhere in this report.

Summary of Crops Grown on the Station

						Tons
Q.57	..	..	..	..	..	187.03
Badila	..	..	..	..	..	39.32
Pindar	..	..	..	..	..	80.01
Trojan	..	..	..	..	..	33.20
Comus	..	..	..	..	..	8.53
S.J.16	..	..	..	..	..	6.48
Mixed experimental varieties	..	..	..	..	..	754.11
Total						1108.68
Plant cane harvested	..	..	..	..	..	597.19
First ratoon cane harvested	..	..	..	..	..	241.43
Second ratoon cane harvested	..	..	..	..	..	270.06
Total cane harvested for milling						1108.68
Used for plants, samples, etc.	..	..	..	..	..	
(estimated)	..	..	..	..	..	124.00
Total Crop						1232.68
Total acreage harvested	..	..	..	..	..	32.30 acres
Average tonnage per acre	..	..	..	..	..	38.16 tons



Fig. 25—The new office-laboratory building on the Mackay Sugar Experiment Station.

Central Sugar Experiment Station

C. G. Story, Officer in Charge

Notes on Weather and Crops in the District

The rainfall at the end of June which upset the commencement of the 1956 crushing was followed by further district rainfall at the beginning of July and end of August, which aggravated harvesting operations and restricted the volume of cane supplies to the mills. The position improved as canefields dried out after the abnormal winter rainfall.

Most of the district was dry during September but minor flooding occurred in October from scattered overnight rains which yielded one to five inches. Monsoonal conditions were experienced six weeks ahead of schedule in November but rain cleared from the district after five days of continual showers which in some cases yielded more than five inches. This rain was responsible for the first major holdup of the 1956 crushing season in the district, and mills lost an average of 60 hours crushing.

Storms throughout the district in December hampered harvesting operations and, following continuous rain from the 16th to the 26th, wet

conditions by the end of the month made harvesting very difficult with mills frequently out of cane.

The rainfall for the calendar year 1956 at the Sugar Experiment Station was 99.97 inches recorded on 129 days; from the 1st July to the 31st December, 24.55 inches were recorded on 37 days.

The absence of the torrential monsoonal deluge with its normal wastage was a feature of the January to June, 1957 period. For the first quarter rainfall was well below the average. Showery weather was experienced during May and June, most of it occurring at night. Total rainfall for the six months was 31.32 inches recorded on 75 days.

The district experienced an open winter in 1956; planting proceeded on better drained areas, but rain delayed the preparation and planting of low wet areas. Planting commenced in earnest at Proserpine and Mackay in August and continued during September with a large amount being performed at week-ends due to field labour shortages. Rain at the end of August further upset planting programmes on lower wet areas and some growers planned to reduce their areas of planting and to ratoon blocks instead. Generally the overall germination was good with reports of odd slow and poor germinations by the end of September; cane ratooned well, with a few reports of poor ratooning, mainly in blocks of Q.50.

**Abstract of Meteorological Observations made at the Central Sugar Experiment
Station during period 1st July, 1956 to 30th June, 1957**

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1956											
July	1.38	4	79	67	72.4	63	38	50.9	21.5	62.72	80.98
August	1.89	7	79	64	72.5	63	40	50.1	22.4	64.63	70.90
September ..	.84	2	83	71.5	76.5	65	42	53.7	22.8	708.0	62.32
October	1.60	7	96.5	76.5	84.5	71.5	53.5	61.0	23.5	78.95	59.61
November ..	7.08	7	97	68.5	85.3	73.5	53	64.7	20.6	79.60	65.15
December ..	11.76	13	97	79.5	87.8	75.5	65	71.4	16.4	82.39	75.03
1957											
January	10.14	11	93.5	75.5	85.5	77	65	70.1	15.4	80.53	73.39
February ..	8.34	14	93.5	76.5	86.6	77	64	71.6	15.0	81.20	77.25
March	6.00	14	86	79.5	83.4	74.5	60.5	67.7	15.7	78.22	76.63
April	.97	5	84.5	80	82.4	71.5	57.5	64.1	18.3	77.15	76.73
May	2.84	15	83.5	71	77.1	66	40	56.6	20.5	69.27	73.29
June	3.03	16	77	69	74.0	63.5	47.5	56.5	17.5	66.52	80.35
Totals ..	55.87	115									

The heavy rainfall late in December had an effect on the growth and stooling of backward late plant and ratoon cane. The drier monsoonal period in 1957 allowed crops to make full use of the rainfall and the heat without water-logging the normally wetter country.

Hail storms are unusual in the sugar belt and rarely occur in the tropical area. However, the months of October, November, and December, 1956, in Mackay were marked by serious electrical storms accompanied by hail which caused some crop damage. Millable cane was, in some cases, destroyed, and large areas of young cane and legume crops were defoliated.

The relatively dry "wet" season with high temperatures and plenty of sunshine gave prospects for a good crop for the 1957 harvest; rain had been well distributed in most of the district. Many canegrowers were busy planting during March-April, it being the first season for four years that a large early planting programme was possible. The three factors combining to allow this were dry weather conditions enabling earlier preparation of land, a plentiful supply of labour, and comparatively good moisture content in the soil. Some growers had finished planting by the end of April and others were well advanced. Rapid germinations and good stooling were ex-

perienced for most of this early planted cane as temperatures were ideal for germination and growth.

**ANNUAL RAINFALL since 1935 at the
Experiment Station, Mackay**

Year	Rainfall (Inches)	Year	Rainfall (Inches)
1935-36 ..	99.57	1946-47 ..	48.09
1936-37 ..	64.21	1947-48 ..	38.40
1937-38 ..	47.31	1948-49 ..	46.95
1938-39 ..	61.29	1949-50 ..	85.48
1939-40 ..	82.86	1950-51 ..	107.63
1940-41 ..	73.71	1951-52 ..	41.68
1941-42 ..	57.75	1952-53 ..	56.58
1942-43 ..	76.13	1953-54 ..	102.57
1943-44 ..	58.67	1954-55 ..	129.44
1944-45 ..	33.53	1955-56 ..	82.27
1945-46 ..	68.52	1956-57 ..	55.87

Average for 22 years — 69.02 inches.

Pests

Damage to the 1956 crop from either greyback or frenchi grubs was negligible. Light flights of both greyback and frenchi beetles occurred in Mackay in December, 1956, but old residents of Carmila West, which is usually a grub-free area, reported the heaviest beetle flight for 30 years. Heavy flights also occurred along Plane

Creek. BHC was applied to 1290 acres in Mackay and 92 acres in the Plane Creek area. Grub damage occurred in untreated cane and losses appear likely to be in the vicinity of 3,000 tons at Farleigh, Camerons Pocket and Calen areas during 1957.

Wallabies were not troublesome to cane during 1956 but in the Plane Creek area during May, 1957, were damaging cane in the drier areas. Two Cane Pest and Disease Control Boards retained their interest in breeding beagle dogs. Rats were prevalent and the infestation was serious by June, 1957. Growers used thallium sulphate and phosphorus baits. *Melomys* were more prevalent than usual in the Balnagowan-Farleigh area.

Small populations of the spur throated locust (*Austracris guttulosa*) (Walk.) continued in many parts of the district until October, 1956. The sugar cane bud moth (Tineidae) was responsible for damage to stalks of Q.50 and Q.58 on seven farms in the Rosella and Eton areas. The black sett-eating beetle (*Metanastes vul-*

givagus) damaged cane setts on the Experiment Station during the 1956 planting season. Further areas of *Margarodes* spp. were reported and insecticidal trials were established in the Plane Creek area. The presence of soldier fly (*Chiromyza rubriceps*) was established in poor patches of ratoon cane. There is a distinct possibility that this insect contributed to the poor ratooning of the variety Q.50 during 1956 on a number of blocks from Loloma to Proserpine. Many of these affected areas were on better class land or on the better portions of the blocks which emphasised the seriousness of an infestation by soldier fly.

Giant Sensitive Plant (*Mimosa invisa*)

Infestations of the giant sensitive plant were discovered in blocks of the perennial legume *Centrosema pubescens* at Alligator Creek, Habana and Proserpine. Following these discoveries a check was made on a number of properties which had planted centro. but, fortunately no other infested areas were found by the



Fig. 26—Portion of the soils laboratory in the new building.

end of June. This pest originated from supplies of centro. seed purchased in 1955. One bag of this seed was examined at Proserpine in 1957 and some of it was sieved. It contained a reasonable proportion of giant sensitive plant seed included among other foreign legume seed. The block planted from some of this seed contained a population of leguminous plants other than centro, and giant sensitive plant; one was temporarily identified as a species of Tephrosia, a legume of tropical Africa known to contain a powerful fish poison and purported to be an efficient parasiticide. This stresses the necessity of a strict control being imposed on imported seed to prevent the ingress of an important pest such as giant sensitive plant. Fortunately, it is susceptible to weedicides—arsenic pentoxide, Pentapine and Pentasote.

Diseases

The total number of farms infected with chlorotic streak disease in the central district increased slightly during the last 12 months. This disease was found in elephant grass and symptoms similar to chlorotic streak disease in para grass at Yukan.

Minor diseases such as eye spot, ring spot, yellow spot and the malformation witches' broom were reported in the district. Pokkah boeng was fairly common. Iron chlorosis affected an area of N.Co.310 ratoons at Andergrove. The variety Q.58 developed a marking on the rind suspected as a development from one of the rots of the leaf sheath.

Bacterial mottle occurred in a number of areas; one small block at Dawlish has a 30 per cent. infection in the variety Q.57. A new outbreak of dwarf disease was rogued at Carmila from a nine-acre block of plant and a one-acre block of first ratoon P.O.J.2878. This is the first report of dwarf disease south of the Rosella-Homebush area where this disease is endemic.

A vigorous campaign for the eventual control of mosaic disease in the central area has been undertaken by the Mackay Cane Pest and Disease Control Board. Oospores of scleroph-

thora disease were present in the leaves of a stool of guinea grass from Inneston.

Clean Cane Plant Propagation

A large tonnage of cane (over 50 per cent.) was crushed from the block plantings established by the Mackay Cane Pest and Disease Control Board in 1955 as nuclei of approved varieties treated at 50°C. for 3 hours. This neglected opportunity on the part of many canegrowers to obtain this clean planting material is serious when it is realised that breakdowns have occurred from the 2-hour treatments. The present programmes operated by Boards are based on 3-hour treatments of nucleus amounts for individual growers each year.

Legume Crops

The seasonal conditions were ideal for legumes and excellent crops of both velvet bean and cowpeas were a feature throughout the district. Crops recovered from hail damage in early December. Culture for treating the seed was in demand.

Molasses and Rotary Filter Mud

There was a keen demand for both of these mill by-products as plant nutrients. Following the excellent results obtained, the popularity of molasses has increased and canegrowers will purchase this material for application to fields at the rate of 1,000 gallons or six tons per acre where the opportunity exists. The necessity for potash in soils of the Central area enhances its value.

New Building

The new tiled roof brick building containing a modern laboratory and offices was officially opened on the 23rd May, 1957, by the Hon. H. H. Collins, Chairman of the Sugar Experiment Stations Board. There has been a keen demand by district canegrowers for the services provided by the soils laboratory.

EXPERIMENT STATION OPERATIONS

Seedling Raising

A total of 8,264 seedlings plus 600 bunch planted seedlings, representing 78 crosses, was planted in the field during late July, 1956. These were from cane seed planted in the glasshouse on the 28th and 29th February, 1956. Hail damage to these seedlings in the field and to the glasshouse occurred on the 4th December, 1956.

Annual Seedling Selection

Both an early and a late selection were made from the series planted in the field in July, 1955. The first at the beginning of July, 1956, resulted in 195 seedlings representing 30 families being planted in 40-sett plots for comparison with the standard Q.50. A number of these had low brix figures but were selected as possible late harvest canes. Forty setts of the following 13 introductions from other districts or countries

were additional to this trial planted in August—B.45/151, B.47/44, B.47/419, Co.285, Co.312, C.P.38/32, C.P.38/34, C.P.50/11, C.P.57/27, Ebene 1/37, I.70, 45M.Q.2569 and 40S.N.746.

The second selection made late in November, 1956, at the age of 17 months yielded a further 14 seedlings; two from the cross Trojan x M.336 had brix figures of 26 and 26.8 degrees compared with 23.6 degrees for the standard Q.50. One feature of this late selection was freedom from red rot.

Progressive Seedling Trials

It was evident by April, 1956, that no variety was outstanding compared with Q.50 in the first ratoon yield observation trial of 21 "M" series seedlings and eight "L" series seedlings. None of these seedlings was worthy of selection in either the plant or ratoon crop. As these did not warrant further trial all were discarded.

The first ratoon yield observation trial of the "M" and "K.P." series seedlings (Badila crosses)



*Fig. 27—A rich land variety, M.251, standing up while Badila (on the right) is lodged.
Photograph taken at Pinnacle Flats.*

gave good results on this poorer soil type, but as these varieties are definitely for better class soils, further plantings were made in a replicated trial at Pinnacle and in five observation propagation plots on suitable areas in 1956.

Twenty-nine of the 1953 series seedlings were selected from the first ratoon 30-sett plots. These seedlings, plus Q.55, were planted in a yield observation trial with Q.50 as the standard. In the plant crop some are comparing favourably with Q.50. These were advanced by the end of November. The foliage of varieties in this trial was severely damaged by hail in December, 1956, but all had recovered by the end of the month when cane was out of hand.

The yield observation trial of 37 "N" series seedlings and two Barbados canes B.40/98 and B.41/211 planted in 1955 was harvested in September, 1956. At harvest some of these varieties compared well with Q.50 and four were possible better land canes. Final selection of any which justify inclusion in a replicated trial will be made on the first ratoon crop in 1957 but, to establish plant supplies, a propagation planting of ten preliminary selections from the plant crop was made on the property selected for such trial.

The progressive trials with seedlings continued on canegrowers' properties. Another seedling, H.106, raised at the Station in 1946, was granted the "Q" number 68.

Variety Introductions

Nine cane varieties released from the Bureau's Brisbane quarantine house during 1956 were planted on the Experiment Station. These included C1.41/70, C.P.44/154, C.P.45/184, C.P.47/193, C.P.50/56, M.147/44, M.311/41, N.Co.376, N.Co.382. In addition the following were received: Azul, B.4362, H.32-6774, H.36-1804, H.37-6819, H.39-3633, H.39-7028, H.44-2818, H.44-3098, H.45-369, H.45.2120, H.45-2708, H.48-3432, 41R.2070, L.423, M.421, Q.59, Q.64, Q.66, Q.67. The last-mentioned was planted in a trial at Pinnacle with the Badila cross seedlings; the remainder are being propagated for planting in progressive trials for assessing their value in comparison with advanced seedlings and commercial varieties.

Experiments with Bagasse and Deep Ripping

The climatic conditions experienced for the second ratoon crop nullified the effects of the treatments. As predicted after the first ratoon crop, no response was expected in a wet year. Although slight differences in tonnage were obtained, results from both first and second ratoons were not as outstanding as in the plant crop, when a 5 ton per acre difference was achieved. Total differences for the three crops on the first cycle of this trial over ordinary farm practice were:

Ripping	4.41 tons per acre
Bagasse plus ripping	8.26 tons per acre

A further crop cycle of cane on this trial site is necessary to obtain information on (a) the longevity of bagasse and ripping treatments, (b) whether main results are immediate to treatment only, and (c) the effect of drier seasonal conditions.

Long Term Trash Trial

Six crops of this trial have been harvested being the plant, first and second ratoon crops of both the first and second rotations. To date there are no definite differences in tonnage due to trash conservation.

Long Term Phosphate Trial

The objectives of this trial are to determine (1) the rate at which this soil becomes depleted in phosphates, (2) whether the amounts used will result in a build-up of soil phosphate, (3) to what extent finely ground rock phosphate may be used to replace superphosphate, (4) whether in this acid soil decomposition of the rock phosphate will be sufficiently rapid to provide crop requirements. There were no significant differences on either the first and second ratoon crops of Q.50 in cycle one or the plant crop of Q.58 in cycle two. On the basis of the original soil analysis of the trial site it is expected that a long period will elapse before significant results are obtained.

Time/Temperature Treatment Trials

Inspection of these trials allowed progressive information to be obtained on the value of the

various treatments in controlling ratoon stunting disease. This is part of a general programme of continuation of research on this disease.

These trials consisted of the second ratoon crop of the trial planted in 1954 and the first ratoon crop of the trial planted in 1955.

Nitrogen Trial—

Sulphate of Ammonia v. Urea

The first ratoon crop of this trial was harvested late in October, 1956. The results of the trial are interesting in that there was a definite response to nitrogen and the heavier amounts gave significantly higher yields than the lower applications, but there were no differences between the two forms of nitrogen. There were no significant differences due to treatments in the monthly c.c.s. figures from July to October, 1956. Similar results were obtained from a trial at Boldon. Urea is an equally efficient supplier of nitrogen for sugar

cane and is recommended, providing the price is equivalent (or less) to that of sulphate of ammonia per unit of nitrogen.

Legume Trials

Four legume trials were planted in 1956. The first consisted of 17 *Phaseolus* spp. and three *Dolichos* spp. None of the former recovered from hail damage in December, 1956, while the *Dolichos* were unsuitable.

The second trial consisted of cowpea varieties C.P.I.9247 and C.P.I.12377 planted in October, 1956. Both gave good early cover which was destroyed by hail in December. These varieties recovered quickly and produced further good cover which was still excellent at plough-out in June, 1957. The results with C.P.I.9247 have been consistently good in this district for a number of years and it is considered a suitable variety for Mackay. C.P.I.12377 has also given good results. Seed of both varieties collected at this Station was propagated in

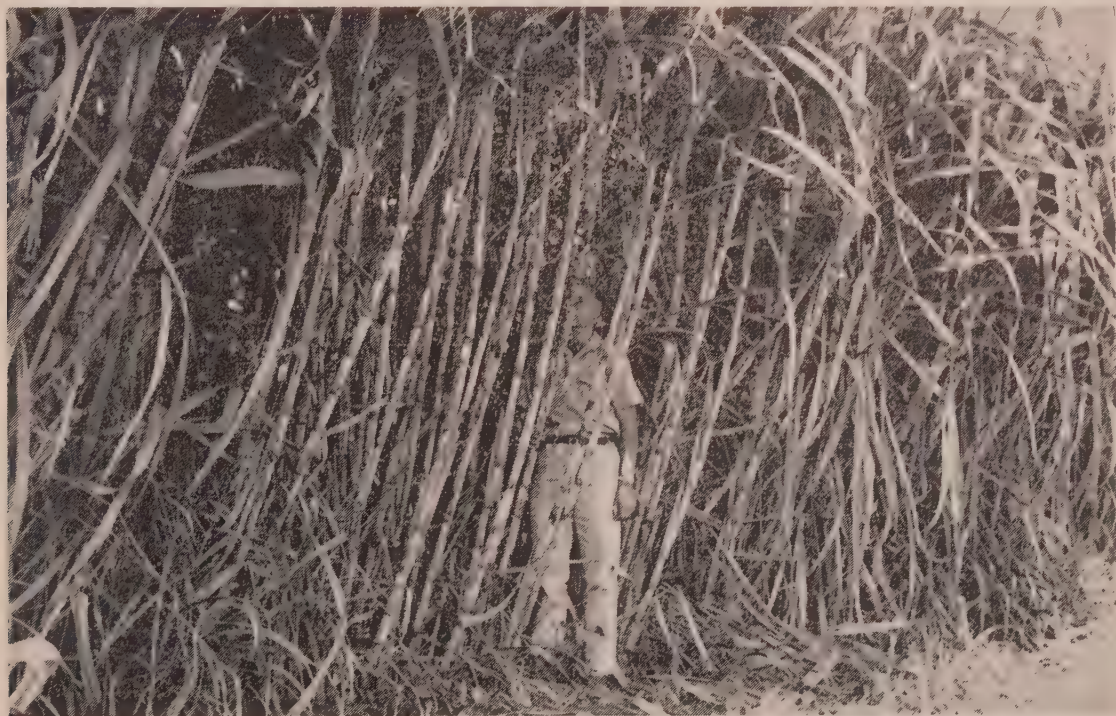


Fig. 28—Q.65, another Mackay seedling, on river country at Gargett.

Southern Queensland for seed supplies and it is proposed to make small plantings on a number of district properties in 1957 before release.

The third and fourth were legume culture trials. Eleven strains of the cowpea—velvet bean group of bacterial inoculum were used to inoculate velvet bean seed planted on blocks where in the past nodulation had not occurred on some inoculated crops. In addition, some untreated rows were topdressed with sulphate of ammonia at the rate of 2 cwt. per acre and one half of each trial area was limed at the rate of 2 tons per acre.

Nodulation occurred in all treatments including the check rows but no identification of the latter strain was made. A check on the pH at ploughout eight months later, showed readings of 4.58 for the non-limed and 5.21 for the limed area.

Annual Field Day

Climatic conditions were excellent for the combined Official Opening of the new building and the Annual Field Day on the 23rd May, 1957. The day was very successful, with an attendance of 650 visitors, including industry representatives from most sugar districts in the State. Among the many features on the Station, a display of advanced seedlings, new varieties, and specimens of the giant sensitive plant created considerable interest. The tractor and implement display was excellent.

Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year —

Experiment Station	966
Farm Trials	532
Growers' Samples	179
Show Canes	40
	1,717

Summary of Crops Grown on Station

Varieties harvested during 1956 Season—

									Tons
Q.50	..	..	..	..	..	..	..	..	129.3625
Q.58	..	..	..	..	..	..	..	..	62.075
Seedlings	..	..	..	..	..	..	..	..	367.0125
Total	..	..	..	..	..	..	..	..	558.45
Plant Cane harvested	..	..	..	..	..	..	..	..	269.025
First Ratoon Cane harvested	..	..	..	..	..	..	..	..	157.6875
Second Ratoon Cane harvested	..	..	..	..	..	..	..	..	131.7375
Total	..	..	..	..	..	..	..	..	558.45
Total Cane harvested for Mill	..	..	..	..	..	..	..	..	558.45
Used for samples, plants, farm propagation	..	..	..	..	..	..	..	..	37.0625
									595.5125
Total acreage harvested	..	..	..	..	..	..	..	..	26.99
Average tonnage per acre	..	..	..	..	..	..	..	..	22.07

Southern Sugar Experiment Station

H. G. Knust, Officer in Charge

Weather and Crop Notes

Normal weather conditions prevailed during the winter months of 1956. Frosts which occurred in July and August caused superficial damage from which crops soon recovered.

Dry conditions set in soon after the beginning of July and as the season progressed, the threat of drought became manifest. It was not until the end of December, 1956, that good rain accompanied by gale force winds provided temporary relief. Rainfall since then was inadequate for crop needs and as a consequence crops on non-irrigated lands showed considerable drought distress by the end of June, 1957.

Rainfall for the year—28.01 inches—was well below the average and was the lowest yearly rainfall recorded since 1946. Planting during the autumn months of 1957 was delayed until the end of March and early April because of poor growth and consequent shortage of planting material as the result of near-drought conditions. Germination of autumn planted cane was satisfactory, but subsequent growth left much

to be desired and will undoubtedly be reflected in over-all yields for the 1958 harvest. Winter conditions to the end of June were mild.

The 1956 Harvesting Season

The first of the southern factories to begin crushing operations was Isis Central on 20th June and, by 18th July, all southern mills with the exception of Rocky Point were crushing. Crushing at Rocky Point began on 27th August. Excellent weather conditions prevailed for crop removal, and as a consequence no serious delays occurred and crushing operations ended on 29th December. A considerable tonnage of cane was carried-over in one mill area for the 1957 harvest as it was considered uneconomic to harvest after the commencement of 1957.

Cane crushed by the factories in the Bundaberg-Isis district aggregated 1,678,528 tons: this with an out-turn of 211,953 tons of 94 n.t. sugar, constitutes an all-time record. Average yield of 27.75 tons of cane per acre from 60,486 acres is also a record.

The Growing Season for 1957

Curtailement of planting by excessively wet weather in the autumn of 1956 resulted in reduced stands of plant cane which normally provides a nucleus of well-grown crops for early harvest. Spring planted crops germinated slowly, and in some instances poorly. Drought conditions which prevailed throughout the

Fig. 29—An aerial view of the Sugar Experiment Station, which is outlined in white.



greater part of the growing period resulted in overall yields being well down on previous years. It is expected that average yields will be higher than those of previous drought years because of the ability of the present hybrid canes to withstand harsh conditions better than the types then grown.

Ratoon shoots came away slowly in the early part of the season and although normal ratooning prevailed by the end of September, crops were poorly grown and yields will be lower than those produced during recent years.

Irrigation could not be practised by many growers because the water table submerged major pumping units and auxiliary pumps installed at well-heads were too small to deal with the problem. Many irrigated crops were not well-grown as a consequence.

Arrowing was virtually non-existent. Some fields were showing arrows in the wetter portions of the coastal fringe and only an odd arrow was evident in the balance of the district.

Bulk Loading of Sugar

Early in 1957 work commenced on the construction of a bulk sugar terminal for the Bundaberg Harbour Board at an estimated cost of £1,500,000. It is anticipated that the terminal with a storage capacity for 50,000 tons of sugar will be completed in time for the 1958 harvest.

Sugar Cane Pests

A heavy emergence of the cane beetles *L. Trichosterna* Lea and *L. frenchi* Blackb. occurred in the Gooburrum and North Gooburrum areas during October, while *P. furfuracea* Burm emerged from the volcanic soil areas early in December. Damage to crops in the Gooburrum area was greater than elsewhere, although some crops showed damage where *P. furfuracea* occurs. Fumigation with carbon bisulphide was practised where it was considered economical to use it, and ploughing out recommended where cane was poorly grown, particularly in old ratoons. Further trials were established with BHC against the larval stage of all species, but no firm recommendation can be made for the use of this insecticide.

A minor cane grub *Rhopaea mussoni* Blackb. persists in the Coonarr Creek area. This grub is easily controlled with carbon bisulphide and is not as widespread nor as damaging as the other species mentioned above.

Trials with BHC dust, aldrin and dieldrin against *R. dimidiata* are continuing. The results of these trials will not be known until ratooning takes place subsequent to harvesting of the present crops.

A further infestation of the nematode *M. javanica* (Treub) Chitwood was located in another field of cane at Mullet Creek. The field in which it was proposed to plant a variety resistance trial last year was not planted and the planting of this trial had to be deferred until the spring of 1957.

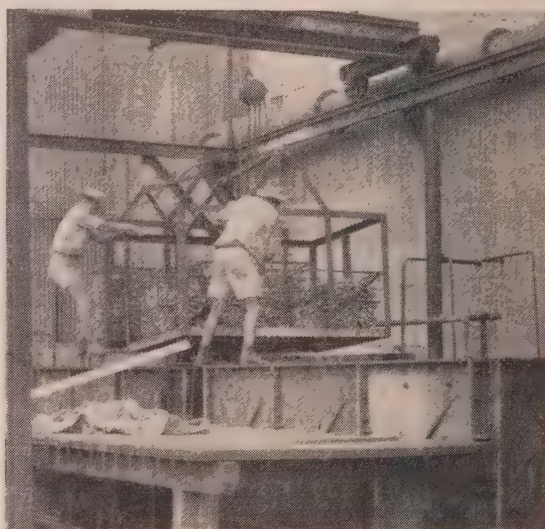


Fig. 30—Baskets of cane plants being placed in a hot-water treatment tank at Isis Central Mill, Childers.

Margarodes sp. is responsible for depressed growth in some fields, particularly in the red volcanic loams, and exploratory trials against this pest have been established with BHC dust and aldrin.

Chlorotic Streak Disease

Chlorotic streak disease, which was found at the end of 1955 for the first time in the Bundaberg and Childers district, is now more wide-

spread at Bundaberg and appears to be confined to one farm at Childers. The disease has now been found on farms along the Burnett and Kolan Rivers and in the poorly-drained lands at Moore Park and Fairymead. Distribution of planting material from infected farms has been prohibited in an endeavour to prevent the spread of the disease.

Ratoon Stunting Disease

Although stocks of hot-water treated cane for the control of ratoon stunting disease were sufficient for the growers' planting needs, Cane Pest and Disease Control Boards have not relaxed their efforts in this regard and are continuing the policy of establishing heat-treated stocks each year. This will ensure a supply of clean planting material and ultimately hasten the elimination of the disease.

Downy Mildew Disease

Fortunately the outbreak of downy mildew disease recorded last year did not spread beyond the one farm. Only twelve infected stools were rogued during the year, compared with 126 in 1955-56. It is hoped to confine the outbreak to its present limits and ultimately eradicate the disease.

Ratooning Trouble

The reason for poor ratooning was again closely investigated. This affection is widespread and not confined to any particular soil type or variety. Trials established with fungicides and the mill by-products—molasses and filter muds—did not increase ratooning vigour or stand. Results of trials established with soil sterilants, insecticides and bagasse will be observed after crops are harvested in 1957. Large colonies of soldier fly larvae *C. rubriceps* Macq. have been found in association with the poor ratooning, and trials against this pest with BHC dust are being established to determine control measures and its possible relationship to poor ratooning.

Distribution of a New Variety

A distribution of disease-free stocks of Q.61 (P.O.J.2878 x Co.290) was made to cane growers during the spring months of 1956. The total number of applications received was 187 for 170 tons. This variety is a mid-season maturing type and should prove to be a valuable addition to the approved variety list in southern Queensland.

Abstract of Meteorological Observations made at the Southern Sugar Experiment Station for the year 1st July, 1956 to 30th June, 1957

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperatures						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1956											
July	1.20	5	75	58	68.68	59	37	46.64	22.04	58.64	83.67
August	0.13	2	74	60	69.48	59	35	45.81	23.67	60.43	45.81
September	0.13	3	78	67	73.35	63	42	50.96	22.39	67.04	63.76
October	1.32	4	84	74	79.61	72	49	60.70	18.91	73.78	62.00
November	4.57	7	90	70	77.77	73	54	62.61	15.16	75.50	66.50
December	9.74	7	91	80	85.15	76	61	68.95	16.20	80.71	71.05
1957											
January	2.33	5	90	79	85.28	73	62	67.92	17.36	80.17	75.42
February	4.40	10	91	82	85.46	78	62	70.35	15.11	80.69	77.02
March	1.03	4	90	80	84.21	72	57	65.34	18.87	78.38	76.31
April	1.38	4	89	78	82.21	66	56	62.36	19.85	76.56	77.16
May	0.70	2	86	69	76.32	66	34	52.34	23.98	67.59	68.79
June	1.08	7	77	67	73.12	62	44	52.29	20.83	64.96	78.54
Totals ..	28.01	60									

RAINFALL RECORDS, 1915-1957

Year	Rainfall Inches	Year	Rainfall Inches
1915-16	28.54	1936-37	31.65
1916-17	58.08	1937-38	44.40
1917-18	49.85	1938-39	41.01
1918-19	24.24	1939-40	41.69
1919-20	28.20	1940-41	43.26
1920-21	45.16	1941-42	33.52
1921-22	44.97	1942-43	40.75
1922-23	37.14	1943-44	45.22
1923-24	34.16	1944-45	28.14
1924-25	50.96	1945-46	26.10
1925-26	37.62	1946-47	44.52
1926-27	68.18	1947-48	57.76
1927-28	74.69	1948-49	40.18
1928-29	31.16	1949-50	59.31
1929-30	43.16	1950-51	50.74
1930-31	47.19	1951-52	40.42
1931-32	22.88	1952-53	48.99
1932-33	36.81	1953-54	45.81
1933-34	71.45	1954-55	73.95
1934-35	40.01	1955-56	71.13
1935-36	44.24	1956-57	28.01

Average for 42 years—44.2.

EXPERIMENT STATION ACTIVITIES

Plant Introduction

Varieties introduced from the Bureau's Brisbane quarantine consisted of C.P.44-154, C.P. 45-184, C.P.50-56, C.P.47-193, Cl.41-70, H.54-6195, H.54-6233, H.54-6359, H.54-6372, M.311-41, M.129-43, M.147-44, N.Co.376, N.Co.382, 28 N.G. 219 and S. spont. M. Moentai which were imported from overseas in 1955, and B.4459, B.46199, B.48123, B.48124, H.36-7913, H.44-3382, H.45-2654, H.47-4635, H.48-3166, 47 R.2777, 47 R. 4066, 50 BN. 7727 and 50 BN.8186 made available by the Colonial Sugar Refining Company. B.4362, H.39-3633, H.39-7028, H.44-2818, H.44-3098, H.45-369, H.45-2120, H.45-2708, L.233, K.641, L.423 and L.469 were introduced from propagation in other Queensland districts.

Isolation Nursery, Beerwah

Eighteen Q.53 series seedlings were selected from the first ratoon crop of these canes and forwarded to the Beerwah isolation nursery for ultimate planting and trial in the Moreton district.

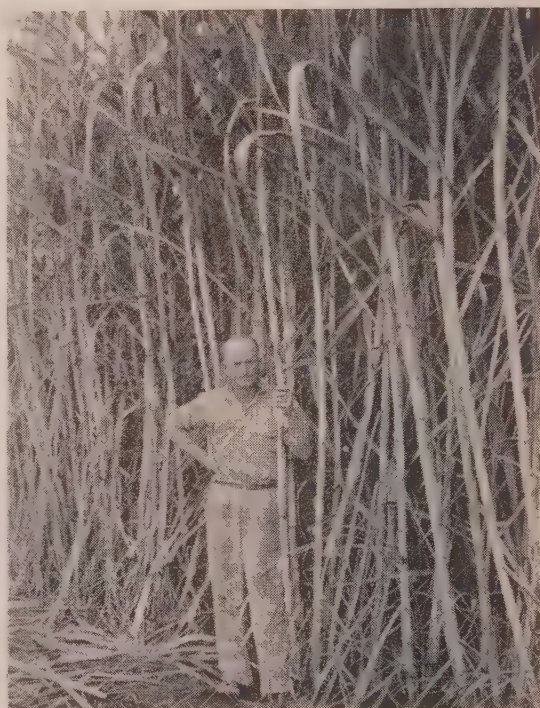


Fig. 31—A well-grown stand of 10 months Q.61 on a Bundaberg cane farm.

Transfer of Introduced Canes

Canes transferred from the Station and the Elliott Variety Garden to the Moreton district for propagation and subsequent trial consisted of Co.285, Co.312, C.P.33-409, C.P.36-138, C.P.48-103, E.1/37, Cl.41-142, F.31-436, F.31-932, F.36-819, H.39-5803, H.47-2910, M.336 and P.R.1000.

Annual Seedling Selection

Eighty-seven Q.55 series seedlings were selected during annual seedling selection and subsequently planted in the first selection trial with a standard variety for comparison.

Selections were also made from the 770 Q.54 series seedlings planted in 1955 under the new

seedling testing programme. A total of 206 selections was made from this group and planted in replicated 10-sett and in 40-sett selection trials with a standard variety.

Replicated Randomised Trial

Harvest results obtained from the plant replicated randomised trial with 30 "N" series seedlings B.41-211, B.41-227, C.P.43-47, C.P.44-155, H.39-5803, and H.47-2910 indicated that several of the "N" series seedlings and B.41-227 show sufficient promise to warrant further trial.

Reassessment of Some Old Varieties

Interesting results were obtained from the plant trials harvested. These trials were established with planting material free of ratoon stunting disease to assess the growth potential in canes which may have degenerated as a result of the infection. The first trial harvested included N.Co.310, C.P.29/116, Vesta, Q.47, and Q.50 as the new canes, and P.O.J.2878 and M.1900S as the older ones. All the new canes significantly exceeded the older in tons of cane

and tons of sugar per acre. The second trial harvested included Q.47, Q.49, Q.50, and C.P.29/116 as the new varieties and Co.281, Co.290, M.189, P.O.J. 2878, and Q.813 as the older ones. Q.47 and Q.50 significantly exceeded all of the older types in tons of cane and tons of sugar per acre. C.P.29/116 significantly exceeded all of the older canes in tons of cane per acre, but only exceeded Q.813 and M.189 in tons of sugar per acre; while Q.49 significantly exceeded Co.281, Q.813, and M.189 in tons of cane per acre and Q.813 in tons of sugar per acre. Sufficient clean stocks of D.1135 and P.O.J.2714 were available for establishing a trial with Q.47, Q.50, and C.P.29/116 in the spring of 1957.

Germination Trial

The germination trial to determine the sensitivity of a variety to hot water treatment yielded some very interesting results. The highly heat-sensitive variety Q.55 was used in this experiment. Cane was cut nine to nil days before being subjected to heat treatment, and exposed

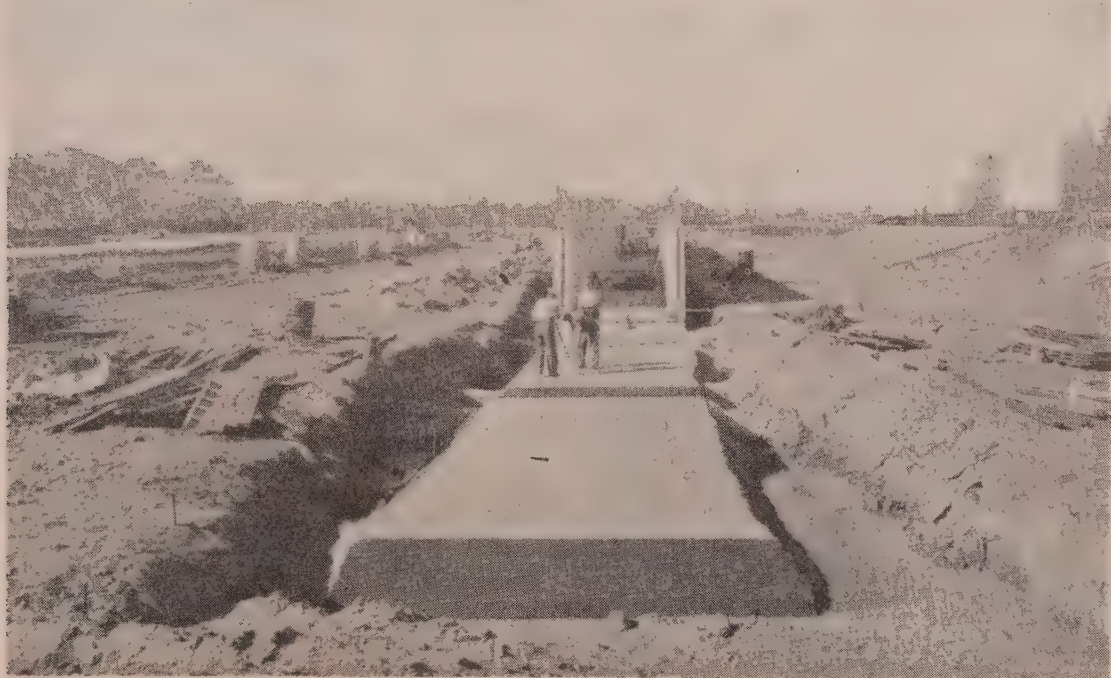


Fig. 32—Initial work on the Bundaberg bulk sugar terminal. Picture shows construction of the conveyor tunnel.

to the weather before being cut into setts. All treatments were then water treated at 50°C. for three hours, and planted after they were air cooled. Maximum screen temperatures were fairly consistent during the exposure period varying from 67 degrees F. to 72 degrees F. Minimum screen temperatures showed a wider variation, from 36 degrees F. to 57 degrees F. with light frost occurring on the first morning after cutting of the cane commenced. A significant increase in germination was recorded in cane cut two or more days before heat treatment, when compared with no delay or one day's delay. Cane treated one day after cutting gave a better germination than cane treated on the day of cutting.

Permanent Trash Trial

The harvesting of the plant crop of this trash trial—inaugurated in 1933, at a time when pre-harvest burning was coming into vogue—marked the commencement of the sixth rotation of the experiment. The procedure adopted is to conserve trash in alternate interspaces in comparison with the complete destruction of all crop residues. Investigations in some overseas sugar growing countries led to the belief that trash conservation benefits may be related to the potash content of the trash, particularly on potash deficient soils. As a consequence a fertilizer trial to determine the gain from the use of potash was superimposed on the second ratoon crop of the fifth crop cycle and yields

suggested that crop losses occur with the elimination of this plantfood, even where trash has been conserved. This trend was confirmed in the plant yields of the sixth cycle, particularly in the no-trash plots where valuable ash is blown away before it can be worked back into the soil.

Trash-Fertilizer-Legume Trial

Harvesting of the second ratoon crop concluded the fifth cycle of this fertilizer and plant residue trial which was inaugurated in March, 1938. The trial area is divided into six blocks, and on two of these the trash is burnt at harvesting and no green manure crop is grown during the fallow; on another two the trash is also burnt, but a green manure crop is grown before planting cane, while on the remaining two blocks the trash is turned into the soil and a green manure crop is also grown. Superimposed on these broad treatments is a fertility trial which includes K, PK, NK, and NPK dressings, and their reaction is noted in relation to the basic treatments. The broad treatments "green-manure" and "trash plus green manure" were superior to "trash burnt and no green manure." In all broad treatments the response to N was significant in both cane and sugar per acre.

Station Drainage

For many years, following heavy rain, the drain pipe from the depression at the rear of the laboratory-office building has not been

Year of Harvest	Variety and Class	Trash Plots		No Trash Plots	
		Cane per acre tons	Sugar per acre tons	Cane per acre tons	Sugar per acre tons
1934	Q.813 Pl.	36.2	5.83	36.2	5.68
1935	Q.813 1st R.	9.4	1.24	13.1	1.69
1937	P.O.J.2725 Pl.	19.1	3.11	18.6	3.11
1938	P.O.J.2725 1st R.	39.5	5.53	34.7	5.03
1939	P.O.J.2725 2nd R.	30.9	4.85	29.0	4.41
1941	P.O.J.2878 Pl.	44.0	6.42	43.9	6.25
1943	P.O.J.2878 S/O 1R.	42.9	6.48	43.6	6.67
1946	P.O.J.2878 S/O A.P. ...	15.7	1.95	17.1	2.09
1948	Q.49 Pl.	42.1	6.38	44.9	6.88
1949	Q.49 1st Ratoon	30.7	4.15	29.7	4.08
1950	Q.49 2nd Ratoon	37.4	4.54	37.1	4.47
1952	Q.49 Pl.	22.8	2.78	22.9	2.76
1953	Q.49 1st Ratoon	43.4	5.93	38.7	4.95
1954	Q.49 2nd Ratoon	38.8	5.29	34.4	4.82
1956	Q.49 Pl.	47.8	5.76	44.2	5.64
		500.7	70.24	488.1	68.53

able to cope with the volume of storm-water. During this year, a larger drain was laid and it is anticipated that the flood problem will be overcome.



Fig. 33—The extreme versality of plastic tubing as a water carrier is demonstrated at the Bundaberg Experiment Station Field Day.

Annual Field Day

Annual Field Day was held on the Station in mid-June, 1957, and was attended by some 450 cane growers, mill officers, and other persons associated with the industry, who showed keen interest in seedling raising, varietal testing, and other investigational work.

Laboratory Work

Following is a summary of cane and water samples handled during the year:—

Station and trial cane samples	1,267
Farmers' cane samples	528
Irrigation waters	89
	1,884

Summary of Crops Grown on Station

	Tons.
Seedlings	316.975
Q.50	193.325
Q.49	99.3875
Q.47	49.9
N.Co.310	38.725
Vesta	35.725
C.P.29/116	35.15
Pindar	34.5
P.O.J.2878	23.325
Co.290	8.0
Mixed	78.0625
	913.075
Plant cane harvested	586.9
Ratoon cane harvested	326.175
	913.075
Total cane harvested for mill ..	886.425
Used for samples and plants ..	26.65
	913.075
Total acreage harvested ..	22.812 acres
Average tonnage per acre ..	40.021 tons



Fig. 34—Plastic tubing carrying water from the pump to an irrigation ditch.

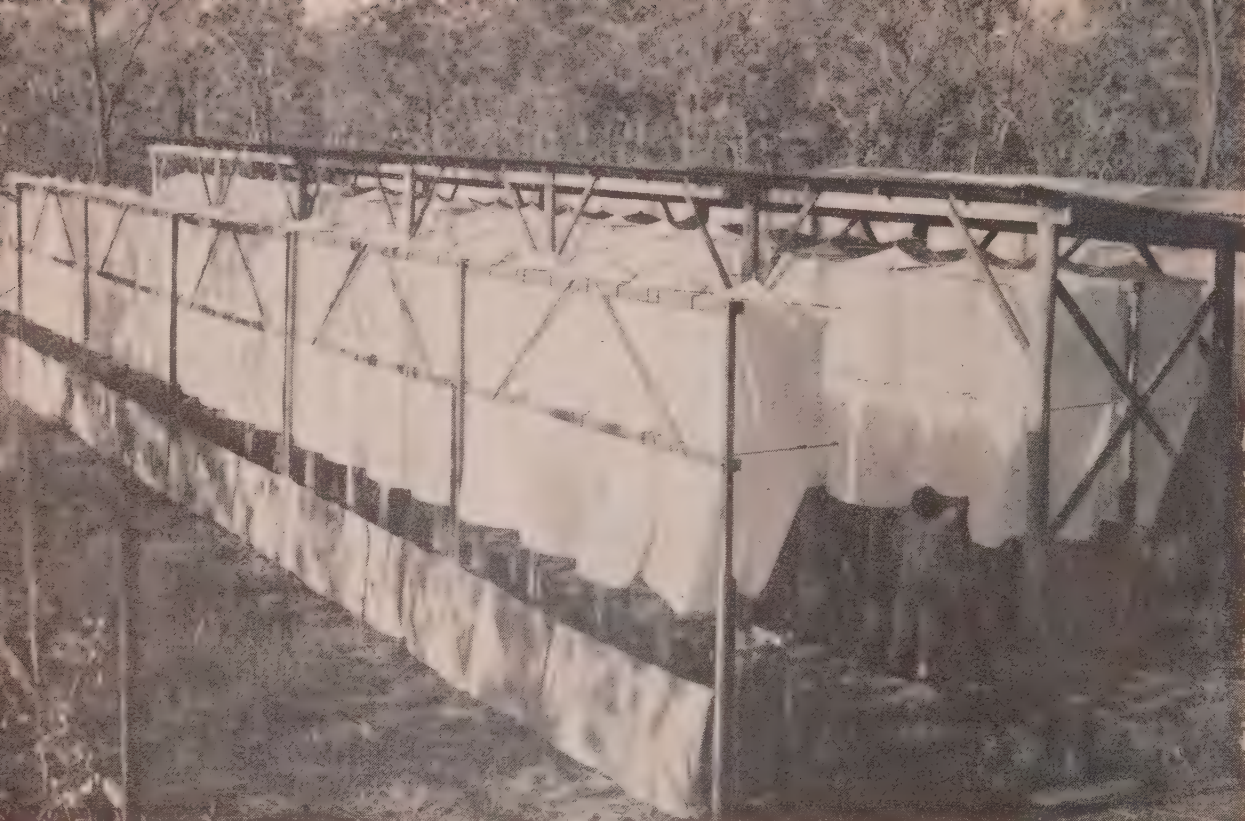


Fig. 35—Portion of the 144 lanterns used in cross-pollination at Meringa in 1957.

Division of Plant Breeding

J. H. Buzacott, Senior Plant Breeder

Introduction

The year 1957 was ushered in by an unusually early wet season which commenced in December, 1956, with very heavy rain and followed on into January. February and March were relatively dry, but April, May, and June had more than the normal number of wet days. As a result of these unusual conditions arrowing was early, and in some varieties free, whilst the ripening of seed was rendered difficult by continual showers. Amongst commercial varieties, Trojan, Q.44, Q.50, and Q.59 arrowed very freely. For the latter variety this was unusual as it is a rather shy arrower. Another variety which very rarely flowers, but which produced a few

arrows this year, is Q.64 and as it is a strong male this cane might prove an important addition to the breeding programme. Major projects of the Division during the year included further stages in the reorganisation of the cross-pollination technique, the installation of new equipment, including a glasshouse and a soil steriliser, and investigations into methods of selection.

New Equipment

Following the destruction of the glasshouse at the Northern Sugar Experiment Station by the 1956 cyclone a prefabricated glasshouse was purchased from England. As a result a fine new glasshouse 45 feet long by 28 feet wide and with a floor space of some 1,200 square feet was available for the 1957 seedling raising campaign. This house is thirteen feet high and will provide head room for arrowing canes if required. It is divided into two sections, one of which is electrically heated.

The electric soil sterilizer which was mentioned in last year's Annual Report as having been ordered from England, was duly received and placed into service at Meringa. It has been used to sterilise soil in readiness for the 1957 seedling raising and has resulted in an increase in the rate of sterilisation.

The low temperature refrigerator, purchased in 1956, was used for the long-period storage of seed, and seed stored in it gave a good and vigorous germination after twelve months' storage. The refrigerator formerly used is now utilised for keeping that seed which will be planted within a comparatively short period after packing.

A thermostatically-controlled electric oven with air circulation was purchased for the test germination of cane seed. It was hoped that a method of testing germination before packing the seed would render it possible to discard

cane fuzz which showed poor or no germination and so save both the labour of packing and packing materials. However, the differential between optimum seedling raising temperature and the air temperature at Meringa is too small for the thermostat to work satisfactorily and further investigations will be necessary before the method can be used for the discard of fuzz.

Equipment for the use of incident light for illumination of specimens on the stage of the "Ortholux" microscope was purchased and will prove useful especially for photomicrography.

Cross-pollination

In conformity with the early flowering which occurred this year cross-pollination commenced in mid-May and was virtually concluded by the end of June. Since a number of varieties which seldom flower, such as Q.57 and Q.64, produced flowers this year the short-pollination period



Fig. 36—The 1957 polycross with 590 arrows.

was a very active one and a large number of crosses were made. Pindar, which in the far north normally shows no viable pollen, this year gave tests of up to 15 per cent. This variety has not produced seedlings at Meringa in the past, but has once again been tried in a number of crosses. Arrowing delay in important early flowering varieties was achieved by the use of a lighting system and also by spraying with maleic hydrazide. A preliminary experiment with gibberellic acid to try to induce flowering in cane was conducted with four varieties. A solution strength of 100 micrograms per millilitre applied at the rate of 50 and 100 micrograms per spindle was used. Only one application was made, during May, and the gibberellic acid was applied to the spindle. None of the stalks treated produced flowers and, applied in this manner, the chemical was not effective for the induction of flowering. The material was not received in time for an earlier application.

The re-equipment of the cross-pollination installation, which was commenced in the previous year, was taken a further stage in readiness for the flowering season of 1957. As a result the cane breeders now have a permanent establishment of 140 lantern frames equipped with pollen-proof fabric lanterns. Of this total, fifty-six are covered by a galvanised iron shelter. The purpose of this was to see whether less moulding of arrows occurred in sheltered lanterns than in unsheltered ones. Due to the almost continuous showers during cross-pollination the development of mould on arrows was tested very thoroughly this year and as its incidence appeared to be no worse in the uncovered lanterns the roofed section will not be extended.

Prior to 1957 the stock solutions of sulphurous acid and phosphoric acid were kept separately, and only mixed when the diluted solutions were prepared during the setting up of crosses. This



Fig. 37—The packing room in which cane fuzz is sealed in pliofilm bags for cold storage.

year the concentrated stock solutions were mixed and this resulted in a considerable saving of time since only one measurement had to be made instead of two for each cross. An additional saving of time was effected by the establishment of a 400 gallon tank, with a large delivery pipe, in the cross-pollination field. This tank was kept filled from the water mains and its rapid delivery resulted in much quicker filling of drums. A further improvement of the crossing field was the construction of a roomy shed. In the off-season this will serve to store cross-pollination equipment whilst during the cross-pollination period it provides space for making up solutions and other necessary activities which are better conducted under cover.

A total of 376 bi-parental crosses was made and a polycross of 590 arrows representing 43 varieties was maintained. The polycross is a necessary complement to the cane breeding work to enable sufficient seed to be produced for bunch-planting purposes.

Seedling Raising

The germination of seed was relatively good at all Stations but death of seedlings in the flats was severe at the Southern, the Burdekin and the Northern Sugar Experiment Stations. At these three stations fresh 1956 seed was planted whilst at the Central Sugar Experiment Station, where stored 1955 seed was planted, the same trouble did not occur.

The Mackay seedlings, which developed from seed planted in February, 1956, were transplanted to the field in July whilst at the other Stations, where seed was planted in July, transplantation to the field was done in October and November. All seedlings at Bundaberg and Burdekin were singly-planted whilst at Meringa and Mackay both single-planting and bunchplanting methods were used. The complete planting consisted of 7,067 single-planted seedlings and 3,136 bunches at Meringa, 4,704 single-planted at the Burdekin, 8,264 single-planted and 640 bunches at Mackay and 5,989 single-planted seedlings at Bundaberg. This makes a total of 27,704 single-planted seedlings and 3,776 bunches — an

approximate grand total of 65,000 seedlings for the four Stations.

Selection Experiments

The Senior Geneticist has devoted much attention to methods of selection. Following the devastation of the 1955 bunch-planting experiment by the 1956 cyclone the ratoons of the same trial in 1957 suffered from excessive environmental variation in the standard variety plots and it was not possible to draw valid conclusions from the experiment. A Technical Communication on the first stage in the investigation of the implications of bunch-planting was prepared by the Senior Geneticist and submitted for publication. Results of the 1954 selection rate experiment showed strongly in favour of an increase from the approximate two per cent. selection rate which was then applied to original seedlings, and also indicated the desirability of



Fig. 38—Showing the excellent stooling of the New Guinea robustum 51N.G.140 at Meringa.

the interpolation of a 4-sett plot between the original seedlings and the 30-sett plot. Unfortunately the selection method trials at Bundaberg, which included a 10-sett randomised block trial, were devastated by one of the worst droughts experienced in that area for many years. As a result much of this work will have to be repeated. The replacement of the unreplicated, yield-observation trials, which have been standard practice for a number of years, with a randomised yield-observation trial using smaller plots has shown promising results at Meringa and Bundaberg and was introduced to the Burdekin Station in 1956.

Chromosome Counts

The counting of chromosomes has been relegated to the status of a minor project. The Technical Officer engaged in the work has gained experience in the use of a number of methods and has developed a technique which results in strongly strained chromosomes suitably spread for counting. It is now proposed to make counts only when they might assist in determining the

results of early hybridisations between the various species of *Saccharum* and related genera.

Sub-stations

A full programme of planting and selection was effected in the seedling raising sub-stations of Babinda and Innisfail. One thousand and ninety-one seedling varieties were introduced to Babinda during 1956 and 1,192 to the Innisfail sub-station. At Babinda 102 selections from the previous year's seedlings were made and planted in 40-sett plots, whilst at Innisfail 131 selections were made and planted in 30-sett plots together with 35 varieties introduced from miscellaneous sources. In addition 99 varieties selected from a Meringa bunch-planting experiment were planted at Innisfail. Eighteen varieties were selected at the Bundaberg Station for planting at the Nambour sub-station.

Rich Land Varieties

The variety I.233, which continued to show good results on rich land, was allotted the number Q.66 and promises to become popular on farms where most other varieties lodge. A

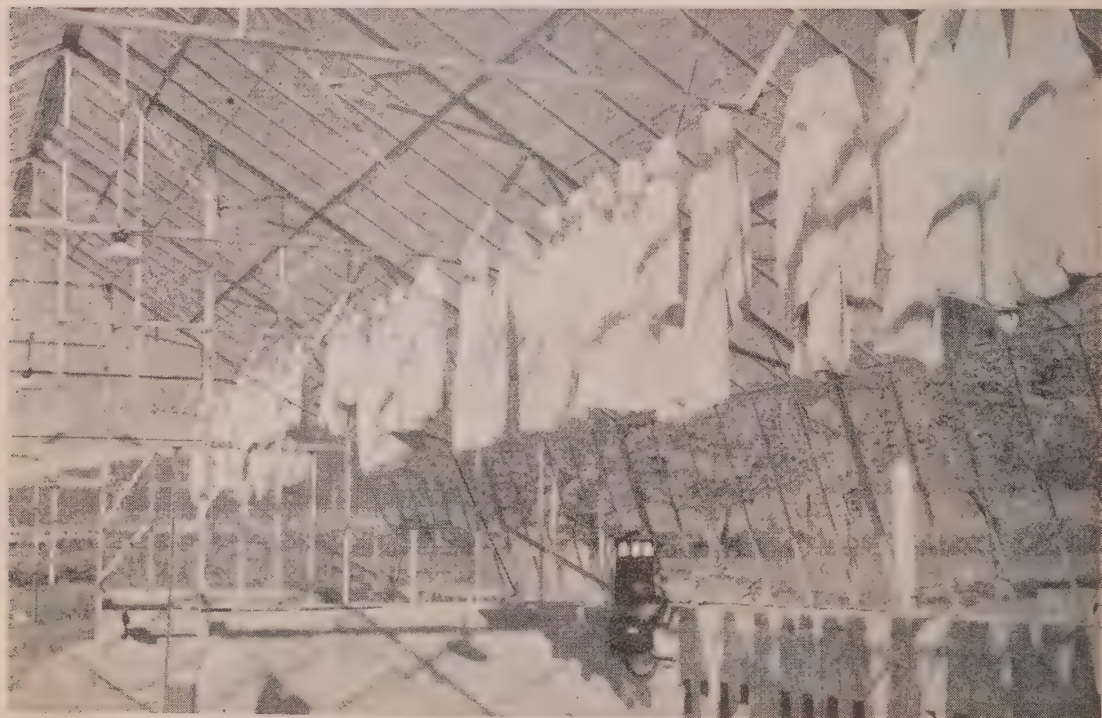


Fig. 39—Fuzz drying in muslin bags in the new Meringa glasshouse.

rich land yield-observation trial on the Northern Sugar Experiment Station experienced conditions conducive to lodging and by July, 1957, only one variety, L.469, remained erect. This cane has given a very good performance in the Burdekin district and has been allotted the number Q.67. It is a variety which strongly resembles its female parent Trojan, but does not stool so well, although it has better cover, much higher early sugar, and is more resistant to both lodging and yellow spot than is Trojan. In the Ingham district six seedling varieties from Bundaberg, ten from Mackay, six from the Burdekin, and eight from Meringa were planted out on low land to test their resistance to lodging. In that area the most resistant varieties to lodging in the present trial appear to be Q.57 and Q.66. Seedlings selected for possible anti-lodging characters were also planted on low land in the Mackay district. Two seedlings, K.P.288 and M.251, showed distinct resistance to lodging in the trials, whilst in limited plantings the performance of Q.67 was outstanding.

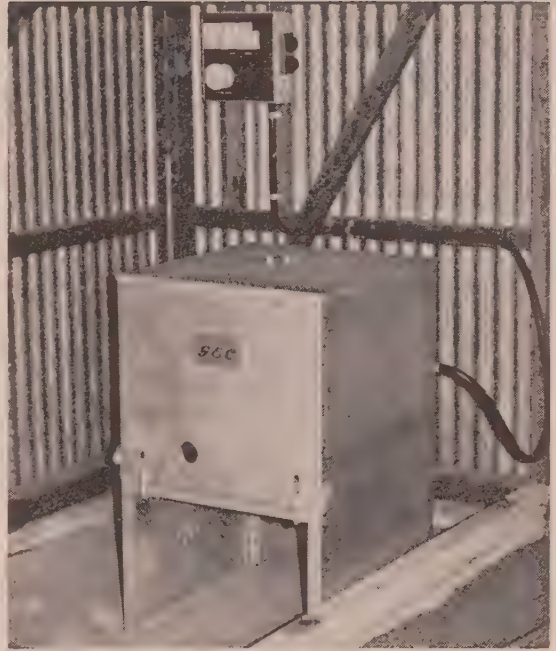


Fig. 40—The electric soil sterilizer used for the first time at Meringa this year.

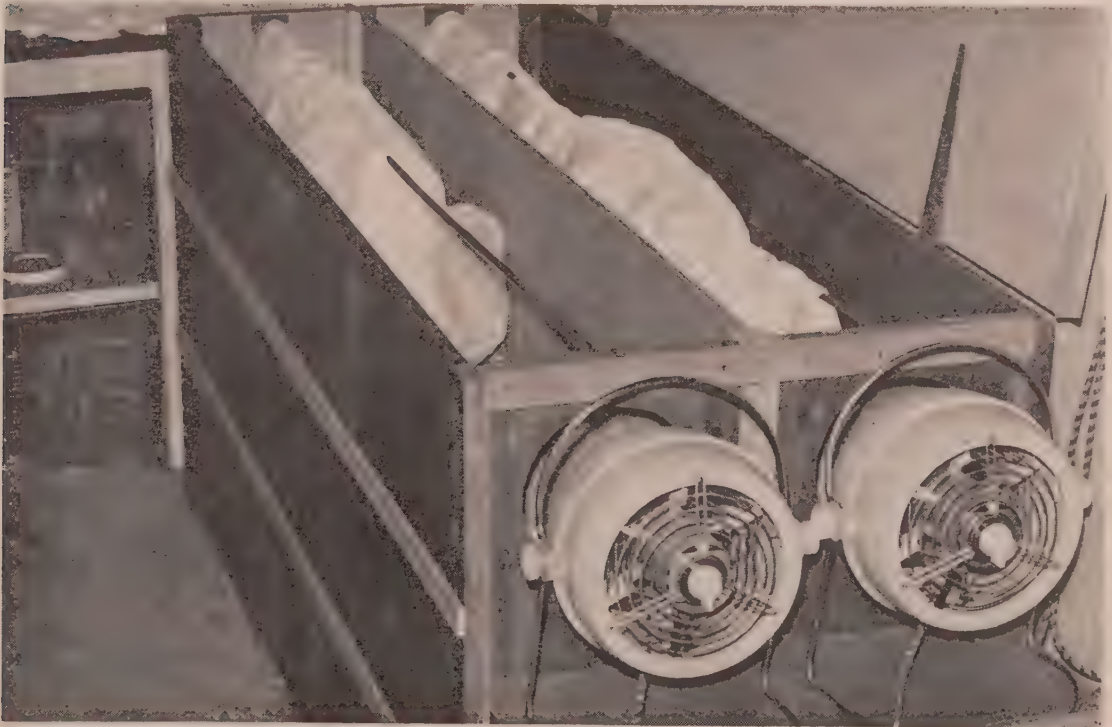


Fig. 41—The fuzz-drying box at Meringa. It is fitted with two electric heater-blower units.

Legume Breeding

The legume breeding project which was initiated in 1955 made further progress. F2 seed from a number of crosses was planted in an observation trial together with plots of the parent varieties. A planting made in early December was followed by heavy rain and an intense development of *Phytophthora* wilt occurred. Within a short period the crosses C.P.I.9259 x C.P.I.9432, Groit x Malabar, and C.P.I.9247 x Poona completely succumbed to the disease. The three crosses C.P.I.12153 x Malabar, C.P.I.12153 x Black Eye No. 5, and Malabar x Black Eye No. 5 showed strong resistance to wilt and even after seven months the first-mentioned two of these crosses still maintained a good ground cover. Seed has been harvested from the three wilt-resistant crosses and it is proposed to continue the planting of this seed for three or four more generations and then to make selections of the best individual plants with a view to their ultimate propagation for commercial planting. Bulk seed of the crosses will also be sent to other parts of the State and in this way it should be possible to select types of cowpea suitable for all mill areas.

This project offers a good deal of promise because, owing to the inferior performance of velvet bean in the far north during the last two years, there is now a strong demand again for cowpeas. The velvet bean has suffered from unfavourable weather conditions and in some instances outbreaks of "little-leaf" disease, *Phytophthora* sp. and *Cercospora* sp. have resulted in poor crops.

Varietal Statistics

Almost nine million tons of cane were crushed in 1956 which was some three hundred and sixty thousand tons more than in the previous year, but still well below the figure for 1954. The 1956 tonnage would have been much higher but for the cyclone which devastated much of the North Queensland area and resulted in a greatly reduced crushing north of Townsville. Losses due to the cyclone were largely made up for by the excellent crop in the southern district where a crop of more than two million tons was harvested.

There was no change in the relative position of the five major varieties and Q.50 retained its honourable position of first variety in the State for the fourth year in succession. This variety now produces more than 85 per cent. of the Mackay-Proserpine crop, but it is likely that this will be its peak because the progress of Q.58 should be manifest in the 1957 and subsequent crops.

Pindar came a very close second with a crop well in excess of two million tons and representing twenty-seven per cent. of the total crop. However, this variety has lost some ground due to its wind susceptibility and its rather low sugar content in some years in the wetter areas of Babinda, Innisfail, and Tully.

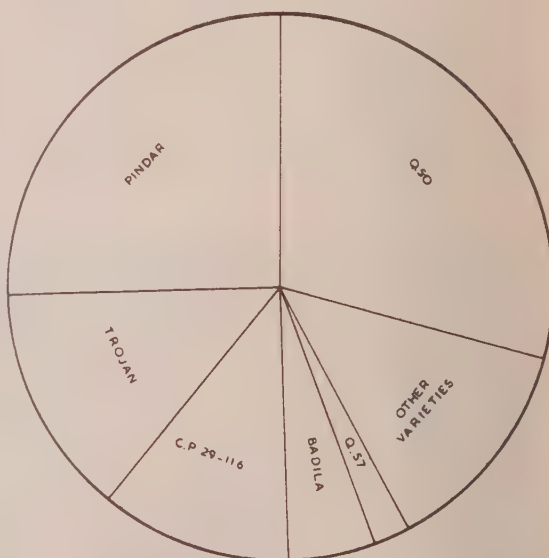


Fig. 42—Relative proportion of main varieties grown in Queensland.

Trojan, still in third place, produced a similar tonnage to the previous year and represented a little less than fourteen per cent. of the crop. The stronghold of this variety is now in the Burdekin district which produced three-quarters of a million tons in 1956.

On account of the excellent crop in Bundaberg the variety C.P.29-116 in fourth position accounted for more than one million tons, some twenty-five thousand tons better than its pre-

vious year's effort. This variety will, however, fall back badly in 1957 due to the bad drought ravaging the southern districts this year and at the present time it seems that C.P.29-116 might easily drop to sixth position in 1957. The once mighty Badila, although it retained fifth position, was responsible for one hundred thousand tons less than in 1956 and dropped from six per cent. to five per cent. of the crop.

Amongst the lesser varieties at least three have made important strides. Its popularity in the Burdekin district was responsible largely for improvement in the position of Q.57 and this variety is destined for a much greater popularity owing to its high sugar content in the unfavourable climates of Babinda and Tully. Although still only 2.2 per cent. of the total crop, from

eleventh in 1955 it ranked sixth in the State in 1956 and was second only to Trojan in the Burdekin district. It is not at all impossible that Q.57 may hurdle Badila in 1957 and assume fifth place. The other variety to make a rapid advance is N.Co.310 which moved from seventeenth position into seventh, its crushing of one hundred and thirty-eight thousand tons representing 1.5 per cent. of the crop. The third variety to advance rapidly was Q.58. This variety moved from nineteenth position to ninth and its excellent performance in the Mackay district, coupled with its great promise in some of the far northern districts, will assure its popularity for some time to come.

Q.47, a major variety in Bundaberg, dropped from seventh variety to eighth due to the in-

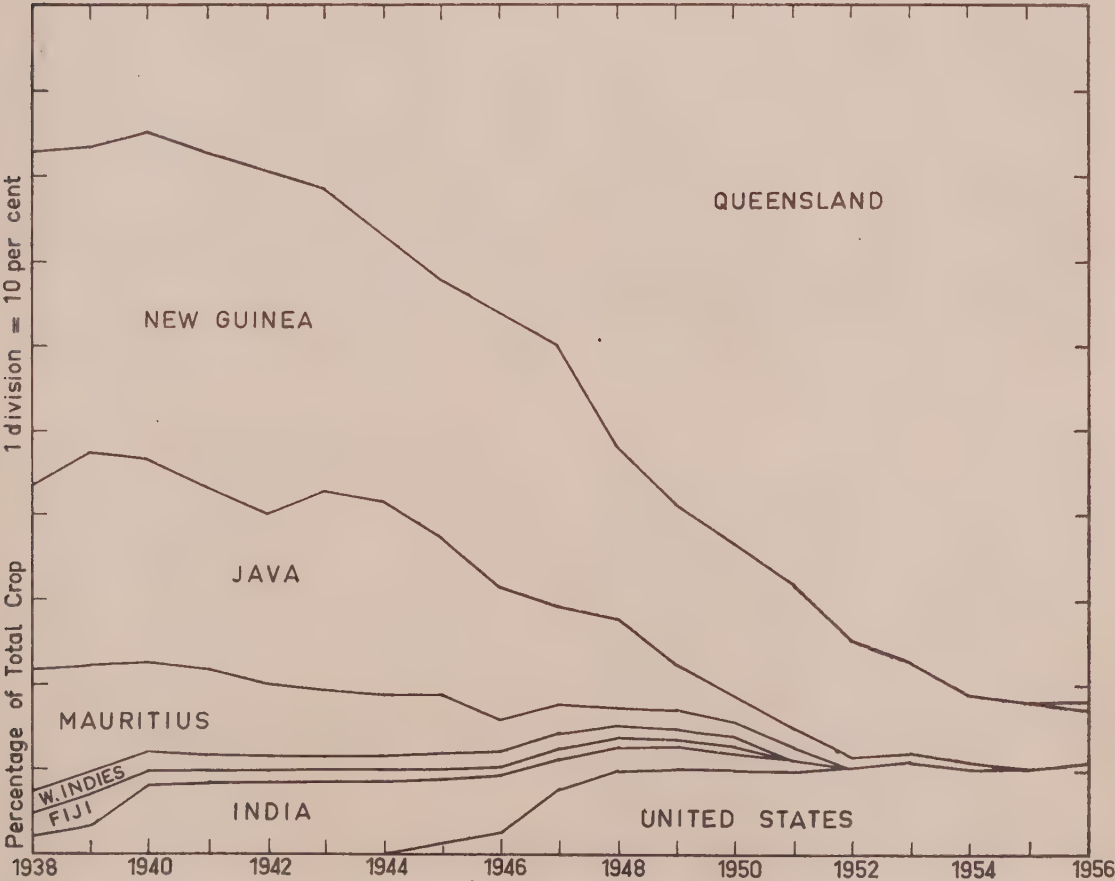


Fig. 43—The composition of the Queensland crop on the basis of country of origin from 1938 to 1956.

crease in Q.57 and N.Co.310, whilst varieties to fall back badly in favour were Eros which dropped from sixth place to tenth, Comus from eighth to thirteenth, S.J.16 from ninth to sixteenth and P.O.J.2878 from fourteenth to eighteenth. A variety which made its first appearance in the list is Q.59, whilst Pompey is no longer listed and has almost disappeared from commercial plantings.

Queensland-Bred Canes

The slight but steady increase which has been occurring for the last several years in the percentage of crop produced from Queensland-bred canes was halted in 1956 although this check is of a temporary nature. The check can be accounted for firstly by the cyclone which considerably reduced the crop north of Townsville; secondly the good crop in the southern areas where C.P. 29-116 represents 48 per cent. of the crop; and thirdly the popularity of N.Co.310 which has now reached over six per cent. of the Bundaberg production. The status of foreign bred canes will lapse badly in the coming year because of the southern drought which must reduce very considerably the percentage of C.P.29-116 and N.Co.310 in the total State crop for 1957. In the meantime the development of the new "Q." varieties referred to in the next section must ensure the resumption of a steady increase in the percentage of Queensland-bred varieties in the near future.

New Varieties

In the far north Q.59, which was first placed on the approved list in 1956, is making steady progress whilst Q.64, which was approved for some mill areas for planting in 1957, is expected to be a purpose variety which may appeal to those growers who prefer a thicker type of cane. The variety L.233 which continues to show great resistance to lodging received the number Q.66, and a Trojan type variety L.469, bred at the Lower Burdekin Experiment Station, was allotted the number Q.67. This variety is also strongly resistant to lodging and farmers who

have areas of land on which most varieties lodge can look forward to the future with greater hope when Q.66 and Q.67 become approved for general planting. Since Q.67 has a higher early sugar content than Trojan it could replace much of that variety on the richer soils of the Burdekin district.

It is expected that Q.63, a very high quality cane, will be approved for planting in the Mackay district in 1958, whilst Q.65, although a late variety, shows some promise as it offers better cover than most varieties developed recently in Mackay. The variety H.106, also bred at Mackay, was given the number Q.68 and it is being propagated for early release.

In the southern district Q.61 was recently approved for general planting and the vigorous and attractive cane formerly known at L.70 has been allotted the number Q.70; if its promise is maintained it is scheduled for approval next year. It is rather anticipated that this latter variety may do well over an extended range of climate and it is now being propagated in observation plots throughout the State.

It is very heartening to see the large number of varieties which are giving yields comparable with or better than those of present commercial varieties and this fact speaks well for the future of the industry from a varietal point of view.

TABLE VII
COUNTRIES OF ORIGIN 1956 CROP

Country of Origin	Tons of Cane	Per cent.
Queensland	7,295,109	81.3
U.S.A.	1,007,655	11.2
New Guinea	468,937	5.2
South Africa	138,220	1.54
Java	53,423	.6
India	12,645	.14
Mauritius	2,092	.02
	8,978,081	100.00

Table VIII

Varietal Composition and Distribution in the Four Main Districts and in the State as a whole — 1956 Crop

Variety	North of Townsville		Burdekin and Giru		Proserpine and Mackay		Bundaberg and South		Whole State	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
1. Q.50	145,614	4.4	11,316	1.0	2,050,980	83.3	415,236	20.6	2,623,146	29.2
2. Pindar	1,893,146	57.1	155,900	13.2	127,249	5.2	116,007	5.8	2,292,302	25.5
3. Trojan	449,191	13.5	755,774	63.8	16,065	0.7	1,035	—	1,222,065	13.6
4. C.P. 29-116 ..	—	—	—	—	40,147	1.6	967,508	48.0	1,007,655	11.2
5. Badila	439,914	13.3	25,041	2.1	3,982	0.2	—	—	468,937	5.2
6. Q.57	36,256	1.1	159,766	13.5	276	—	—	—	196,298	2.2
7. N.Co.310	—	—	—	—	2,778	0.1	135,442	6.7	138,220	1.5
8. Q.47	—	—	—	—	—	—	125,981	6.3	125,981	1.4
9. Q.58	—	—	—	—	118,693	4.8	—	—	118,693	1.3
10. Eros	95,178	2.9	—	—	—	—	—	—	95,178	1.1
11. Vesta	—	—	—	—	—	—	83,678	4.2	83,678	0.9
12. Q.55	—	—	—	—	—	—	80,663	4.0	80,663	0.9
13. Cornus	46,722	1.4	20,750	1.7	11,494	0.5	—	—	78,966	0.9
14. Q.44	68,243	2.1	—	—	—	—	—	—	68,243	0.8
15. Q.28	—	—	—	—	51,326	2.1	9,391	0.5	60,717	0.7
16. S.J.16	—	—	51,583	4.3	—	—	—	—	51,583	0.6
17. Vidar	50,256	1.5	—	—	—	—	—	—	50,256	0.6
18. P.O.J.2878 ..	164	—	—	—	18,739	0.8	30,227	1.5	49,130	0.6
19. Ragnar	34,013	1.0	—	—	—	—	—	—	34,013	0.4
20. S.J.4	14,976	0.4	—	—	—	—	—	—	14,976	0.2
21. Q.49	—	—	—	—	—	—	12,923	0.6	12,923	0.1
22. Cato	12,002	0.4	—	—	—	—	—	—	12,002	0.1
23. Q.51	—	—	—	—	—	—	10,035	0.5	10,035	0.1
24. H.Q.426	6,162	0.2	2,869	0.2	766	—	—	—	9,797	0.1
25. Q.45	—	—	—	—	9,774	0.4	—	—	9,774	0.1
26. Co.301	—	—	—	—	—	—	7,220	0.4	7,220	0.1
27. Co.290	—	—	—	—	851	—	4,574	0.2	5,425	—
28. E.K.28	—	—	1,415	0.1	2,878	0.1	—	—	4,293	—
29. Q.59	2,818	0.1	—	—	—	—	—	—	2,818	—
30. M.1900	—	—	—	—	2,045	0.1	47	—	2,092	—
31. Exp. and Others	20,808	0.6	1,063	0.1	3,976	0.1	15,155	0.7	41,002	0.4
	3,315,463	36.9	1,185,477	13.2	2,462,019	27.4	2,015,122	22.5	8,978,081	100.0

Report of the Division of Entomology and Pathology

R. W. Mungomery, Assistant to Director

Staff

There were no resignations or new appointments during the year and the only staff change that took place was the transfer of Mr. B. T. Egan, Pathologist, from Brisbane to the Meringa Sugar Experiment Station. This move was made in order that a closer check might be kept on diseases generally throughout the northern portion of the State and also that more intensive investigations might be conducted against chlorotic streak, leaf scald, and other diseases that are more prevalent in that wetter zone.

General

Seven proclamations, each dealing with disease control, were gazetted in January, 1957,

in respect of the Moreton, Mossman, and Hambledon mill areas and the Johnstone, Herbert, Haughton, and Mackay districts. As a result it became a uniform requirement throughout the cane-growing areas of Queensland that all planting material used must be free from ratoon stunting and a number of other major diseases, and that diseased cane must be destroyed after the second ratoon crop unless expressly permitted to be grown.

Some of the more far-sighted growers have for years past been building up stocks of hot-water-treated cane so that the major portion, and in some instances the whole, of their farms are now growing disease-free cane. This policy has paid handsome dividends, particularly during the droughty period in the first half of 1957 in South Queensland, when differences as large as ten tons of cane per acre were noticeable between ratoon crops of diseased and healthy cane planted originally under identical conditions. These same droughty conditions have had their influence on the supply of planting material and some blocks of clean cane which were intended for use as plants made insufficient growth. As a consequence it

Fig. 44—A field which was not treated with BHC. This heavy Trojan crop in the Lower Burdekin collapsed because of greyback grub damage.



became necessary in certain circumstances to afford growers some relief and issue permits for the use of some of their older stocks that had not been hot-water-treated. This concession was granted as a temporary measure only and growers were given to understand that they would be obliged to secure sufficient clean planting material this season so as to enable them to revert to the use of disease-free cane in the following year. In other instances, where normal crop rotation had been upset by one cause or another, help was given by extending the period in which diseased ratoon crops could be grown, but it became a necessary requirement that a specified percentage of the diseased crops had to be ploughed out after harvesting. The issuing of permits made necessary by the granting of these concessions involved the field staff in a considerable amount of work outside their normal duties, but this was a worthwhile diversion of effort in that the total amount of diseased cane was systematically reduced and at the same time growers were not subjected to undue hardships.

With the appointment of a joint supervisor for the Invicta (Ingham Line) and Invicta (South of Townsville) Cane Pest and Disease Control Boards, the only Boards in which a supervisor previously did not function, all commercial cane growers throughout the State now have available a service which is designed to provide individual attention to their pest and disease problems. Efficiency in this respect will depend largely on the extent to which growers interest themselves in and make use of the Boards' facilities. For the most part Cane Pest and Disease Control Boards functioned well and, in addition to carrying out their many other duties, they hot-water treated substantial quantities of cane against ratoon stunting disease. In this way conditions were made easy for growers to acquire new stocks of clean material to supersede some of the earlier stocks that had since shown signs of contamination. However, the effort put forward by some Boards was disappointing and it is felt that these same Boards could, with profit, insist on their supervisor displaying greater zeal than hitherto in seeking out some of the less

enlightened growers and inducing them to follow the lead of their more progressive neighbours.



Fig. 45—A heavy infestation of the sugar cane scale insect on a stalk of standover C.P. 29/116 at North Isis, May, 1957.

The annual conference of Cane Pest and Disease Control Boards was held in Ayr on 16th April, 1957, when 46 delegates and 12 Bureau officers attended. Matters dealing with a wide variety of pests and diseases were discussed, and on the administrative side it was recommended that "The Sugar Experiment Stations Acts, 1900 to 1954," be amended to provide for a grower automatically vacating office as a

member of a Cane Pest and Disease Control Board when disposing of his cane-growing interests in that Board's territory. In addition it was submitted that provision should be made in future amendments to the Acts to enable Cane Pest and Disease Control Boards to deal effectively with the giant sensitive weed which was rapidly becoming a cane pest of major proportions. It was also resolved to invite as an observer a representative from a Junior Farmers' Club in the district in which each future conference is held.

The continued spread of chlorotic streak disease over the past year has struck a disappointing note in disease control operations, and the latest extension of this disease simultaneously on a number of farms adjacent to the Burnett and Kolan Rivers has given no clue regarding its origin and means of spread. This outbreak serves to confirm the association of this disease with wet or low-lying areas, and its spread during years of above-average rainfall, but until more is known regarding the manner in which infection takes place preventive measures must follow elementary principles of



Fig. 46—A gap in a block of Q.55 ratoons in the Bundaberg district, which coincided with an infestation of soldier fly larvae.

disease control, i.e., in this case, the use of clean planting material or the curative hot-water treatment of suspect material.

In some areas it seems virtually impossible to keep introduced cane free from chlorotic streak disease for any length of time and, although the planting of diseased cane appears at first sight to be highly unorthodox, a realistic attitude is being adopted in such cases by permitting the planting of cane from lightly diseased fields. This was done on the understanding that small quantities of clean cane will be channelled into these areas from year to year for propagation and subsequent use as plants. It is felt that any insistence on higher standards at this stage would involve the grower in considerable expense in securing all his planting stocks from some outside source without effecting any material improvement in the overall chlorotic streak situation.

On the credit side, the occurrence of mosaic disease has been whittled down considerably in the southern areas by regular roguing and restrictions on plantings. The adoption of a similar policy in the Mackay district, whereby all cane intended for use as plants is to be systematically inspected and rogued where necessary, should improve a situation which showed signs of getting out of hand, and it should remove any threat to the varieties that are at present popular there.

During the 1956-57 growing season only 11 stools were found infected with downy mildew as a legacy from last year's outbreak in the Bundaberg district. These were confined to the same farm and were promptly destroyed. The droughty weather which characterized the first half of 1957 in that area did not provide suitable conditions for the spread of this disease, so its early elimination can be anticipated. Similarly, roguing of Fiji diseased stools in the Rocky Point mill area near Beenleigh amounted to eight stools on four farms, this disease now being at a very low ebb.

It is pleasing to record that our pathologists have isolated and proved the pathogenicity of a bacterium which is responsible for what was hitherto regarded as "root disease" in the Herbert River district. However, because of the characteristic pattern produced on the leaves this disease has since been renamed

"bacterial mottle." Planting material infected with this disease seldom survives long after the young shoots show through the ground, so the disease is largely a self-cleaning one and unless a severe bombardment comes from some alternative host plant, it is not likely to assume serious proportions.

Damage through pest attack was more serious than for some years past and the loss of 22,000 tons of cane as a result of the activities of grubs of the greyback beetle cannot be viewed with complacency, particularly when it is known that 16,600 tons of this were lost on the Burdekin alone. Some of this loss can be attributed to the application of a poorly formulated BHC product, but there was no evidence to suggest that this pest was developing any resistance to BHC. This inferior product has now ceased to be used and damage through this cause is unlikely to occur again. The remainder of the loss, however, was due to failure on the part of individual growers to anticipate that heavy infestations would occur on their farms; accordingly no protective applications of BHC were made. Risks of this nature should not be taken since this insecticide, when used at the rates recommended, is relatively inexpensive and it is most efficient in destroying grubs of this species; hence crop insurance can be obtained at a low rate of premium.

Other losses amounting to approximately 8,000 tons were caused mainly by frenchi and to a lesser extent by consobrina grubs, though some heavy infestations of the latter occurred in the Mossman area. Similarly other species of grubs have been more active than usual in the Bundaberg and Isis areas, and alarm is felt regarding the tendency in some cases to short fallow and in other cases to standover substantial areas, since these practices must assist appreciably in the natural increase of these pests.

Although timely ploughing operations have been relied on in the past to control these southern two-year cycle grubs, a demand has arisen for a cheap insecticide that will give equal if not even better control, and investigations along these lines have been intensified. Drill dressings do not appear to be the complete answer to this problem and it is hoped that broadcast dressings will achieve more positive results.

Dressings of this latter type gave promise of a long-lasting effect in skirmish tests against the soldier fly, and the solution of this problem appears to be well within sight. In the Bundaberg district there was a remarkable association between soldier fly larvae and poor ratooning, but there were a number of cases in which this insect was not involved, so the problem of poor ratooning is still not fully explained. However, good progress was maintained and the problem continues to be investigated along the broadest possible lines.

Minor pest activities involved funnel ants, wireworms, army worms and termites, but no outbreak of locusts was recorded.

While rat damage in most districts remained well below the high level reached in the 1955 crop, the decline was not so great in some mill areas, and in Central Queensland there was a marked increase since 1956. The aggregate loss of cane, predicted to reach 34,000 tons during the harvesting period, will exceed that caused by grub damage.

Wild pigs in North Queensland and foxes in South Queensland added their quota of damage to that caused by wallabies generally throughout the cane-growing areas, but none of these pests assumed serious proportions.

Further specific details in connection with pests and diseases are given in the following pages by the Senior Entomologist and the Senior Pathologist, respectively.

Entomological Investigations

(G. Wilson, Senior Entomologist)

THE GREYBACK CANE BEETLE, *Dermolepida albohirtum*, Waterhouse

In far northern areas beetle emergence was restricted but the localised flights were numerically stronger than in recent years. On the Lower Burdekin beetles emerged in unexpectedly large numbers on both sides of the river, and in Central Queensland grub infestations increased considerably by comparison with the previous year; old residents at Carmila (near Mackay) where grub damage is unusual, reported the heaviest beetle flights seen for thirty years. Beetle emergence was noted at Mena Creek, Innisfail, during October, 1956, and at Bamboo Creek, Mossman, in November; grub damage to cane near Babinda township, and on one farm on the Palmerston Highway at Innisfail gave evidence of substantial emergences in these localities. On the other hand, in an insecticide trial near the Palmerston Highway the infestation averaged only 0.2 larvae per stool, which was insufficient for trial purposes, and in a

similar trial on red soil between Innisfail and Babinda, the infestation of 1.2 grubs per stool was much below the potential infestation in years prior to the use of benzene hexachloride. The picture that emerges is that in the Burdekin, Mackay and other areas where grub infestation is sporadic and BHC usage may apply to only ten per cent. of the crop, the population levels still fluctuate strongly over wide areas according to seasonal conditions, but from Tully to Mossman the pest is held in bondage by the widespread application of BHC and displays its response to favourable seasons only in small foci of survival. The far northern cane areas are, however, vulnerable to reinfestation from these should the use of BHC be relaxed.

Loss of Cane Through Grub Damage

In the years 1954 to 1956 the loss of cane attributed to greyback grubs ranged between 1,000 and 2,480 tons, but in the 1957 crop it is assessed at 22,000 tons on 3,500 affected acres. The district most affected was the Lower Burdekin, where 13,200 tons were lost on 1,750 affected acres in Pioneer and Kalamia on the north bank, and 3,400 tons were lost on 365 acres at Inkerman on the south bank. In addition, the destruction of roots adversely affected the growth of ratoons and stubble-shaving, which is normally practised to reduce the ridges formed by interspace irrigation, dislodged loose stools. Most of the damage occurred in fields where BHC had not been applied, but at Pioneer and Kalamia an unorthodox BHC formulation, which was adequate in past years when infestations were low, gave only partial protection against the heavier infestations of 1957. The conventional formulation, which has given consistently good results in other districts, is being adopted there for future use. In the central districts, Mackay, Proserpine and Plane Creek, where grub damage was quite negligible in 1956, the losses incurred in 1957 were 3,000 tons on 1,000 acres at Mackay, 574 tons on 80 acres at Plane Creek and 500 tons on 100 acres at Proserpine. In the far north the Babinda crop was reduced by 400 tons on 50 acres, while in other districts the losses ranged from 150 tons to nil.



Fig. 47—Delegates to the Technologists' Conference examining a field of cane uprooted by greyback grubs in the Innisfail area in May, 1957. The cane had not been treated with BHC.

Use of BHC for Grub Control

BHC was applied on 36,049 acres of plant cane, and ratoons which had not been previously treated; and 1,617 acres of ratoons were re-treated. The corresponding acreages for the 1956 crop were 33,246 and 3,358. The increase in applications in the 1957 crop was shared by most districts; a few registered insignificant decreases, but a fall of 850 acres in the Mackay district (from 2,050 to 1,200) was unfortunate in view of the widespread infestations that followed. While some of the BHC applications are specifically aimed at frenchi or consobrina grub control the great majority represent protection against greyback grubs, dual control being obtained in some areas. In addition to the areas recorded above it is estimated that 45,000 acres of ratoons were protected by the residual value of previous plant crop applications; the practice of re-treating ratoons has shown a marked decline.



Fig. 48—This stool of Trojan was lifted from the soil by hand, exposing the greyback grubs which had denuded it of all roots.

Trials with Soil Insecticides Against Grubs

In field trials two methods of applying BHC were compared, and the insecticides aldrin and dieldrin were tested for grub control. Trials were maintained to determine the effect of crude and refined BHC on soil fertility.

Methods of Application of BHC

Single applications of 75 and 100 lb. of 20 per cent. BHC were compared with similar amounts divided between plant and first ratoon dressings. A second ratoon crop in this series showed no significant difference between these rates or methods of application.

Aldrin and Dieldrin

In a trial at Mackay in which no grub infestation took place, the first ratoon crop showed no significant effect on yield following the application, on the plant crop, of one, two and three lb. of aldrin, or one and two lb. of gamma BHC per acre. This supports a similar result in the plant crop, indicating the absence of any phytotoxicity when these insecticides are applied in accordance with recommendations. On red soils at Innisfail two plant crop trials carried infestations which averaged only 0.7 and 0.9 grubs per stool, which were barely sufficient for the purpose of the trials. Grubs in the control plots were destroyed by soil fumigation to ensure normal vigour in the young ratoons, and the plant crop yields showed no significant differences. In the first ratoons on one of these trials, following an infestation of 1.2 grubs per stool, the mean yields in tons of cane per acre were—untreated controls, 31.0; 2 lb. gamma BHC, 37.1; 2 and 4 lb. aldrin, 35.3 and 36.0; 1.2 and 2.4 lb. dieldrin, 37.1 and 33.5. The soil fertility and grub distribution were both uneven, rendering the differences between individual treatments non-significant, but the results, combined with field and laboratory observations, are taken to indicate that aldrin and dieldrin show some promise. The trials were supplemented by pot experiments with third-stage larvae, in which aldrin and dieldrin at eight parts per million of soil gave mortalities at least equal to that caused by a similar concentration of gamma BHC. Unfortunately, aldrin in a field trial, and both aldrin and dieldrin in laboratory tests, gave very poor results against other grub species which sometimes occur in the same territory as the greyback. On the other hand, should aldrin prove useful against the greyback, it may ultimately fill a dual role where that species is accompanied by the funnel ant.

BHC and Soil Fertility

The long-range investigation into the effect of crude or refined BHC on soil fertility passed into its fourth year; a second planting was harvested on the Burdekin site, and third ratoons were cut at Babinda, the Bundaberg site being under young plant cane, following a fallow. In the Burdekin plant crop refined and crude BHC resulted in yields of 45.73 and 43.56 tons per acre respectively, the difference being signifi-



Fig. 49.—Field officers establishing a trial with various insecticides against cane grubs in the Bundaberg district, March, 1957.

cant at the five per cent. level, but as the untreated plots yielded only 43.77 tons per acre it is not concluded that crude BHC had any real deleterious effect. In the third ratoon crop at Babinda there was no significant difference between the mean yields of 22.62, 22.72 and 23.01 tons per acre from crude BHC refined, and untreated controls respectively.

MISCELLANEOUS TWO-YEAR CYCLE BEETLES

An emergence of frenchi beetles, *Lepidiota frenchi*, Blkb., between Meringa in the Mulgrave area and Deeral in the northern section of Babinda, which commenced on 21st December, 1956, was the heaviest observed for many years. In the previous season beetles were numerous in the Highleigh section of Mulgrave and from Gordonvale to Fishery Creek, thus over-lapping

in part the area of heavy emergence in 1957. Third stage larvae, the progeny of the 1955-56 emergence were numerous in Mossman, Hambleton and Mulgrave. In all three areas a few fields which had been ploughed out and replanted immediately, were badly damaged because the owners relied on BHC applied after the cane was established. The Bureau has demonstrated that plant crops can be protected against third-stage frenchi grubs, only by applying the BHC at planting time; officers of the Bureau and Cane Pest Control Boards intensified their efforts in advising growers to that effect, with some success, but the practice should be still more widely adopted.

The grubs caused the loss of 6,±15 tons of cane on 1,066 affected acres. The Mulgrave area lost 4,000 tons on 787 acres; at Mossman 1,200 tons were lost on 120 acres, and at Hambleton, 840 tons on 71 acres. At Tully the species occurs only on a small group of adjoining farms, on which 150 tons were lost on 30 acres. For the fourth year in succession Mackay escaped with relatively little loss, 150 tons on 40 acres, while at Plane Creek the damage was assessed at 75 tons on 18 acres.

In 1954 aldrin completely failed to reduce the frenchi grub population in one field trial. Ratoon crops on other aldrin and dieldrin trials have been harvested but without conclusive results. When screened against second stage larvae in pot tests aldrin and dieldrin at eight parts per million of soil caused practically no mortality over a 23-day period, while gamma BHC at the same concentration gave 83 per cent. control.

There was a heavy flight of *Pseudholophylla furfuracea*, Burm. at Childers in the first half of December, 1956, while infestations of *Lepidiota trichosterna*, Lea in the Gooburrum area increased over those of previous years. A trial with BHC, aldrin, dieldrin, and chlordane against grubs of this latter species revealed that when these insecticides were applied in the drill at planting time at the rate of 2 lb. of active ingredient per acre there was a marked depression in vigour of the young cane when compared with that in the untreated plots. Any quantities less than this amount are not likely to control

third stage grubs, so it is proposed to approach the problem from a different angle and apply broadcast dressings to the soil surface and disc them in prior to planting. In this way it is hoped to intercept the small grubs soon after hatching, since at this stage they are more susceptible to the insecticides. A series of such experiments has been planned against both *P. furfuracea* and *L. trichosterna*.

In the sandy soils at Coonarr Beach infestations of *Rhopaea mussoni*, Blkb., were successfully treated with carbon bisulphide.

THE CONSOBRINA BEETLE, *Lepidiola consobrina*, Gir.

The consobrina beetle was of special interest at Mossman and on one Hambledon farm on the Cook Highway. In previous reports this species



Fig. 50—Insecticidal dusts being applied experimentally behind the mouldboards of a cutter planter, Bundaberg district.

has been grouped with the frenchi beetle because observations made since 1916 indicated that both had a two-year life-cycle and damaged cane in

the spring months; moreover, the distribution of consobrina was limited and lay within the greater area which was subject to infestation by frenchi. The species attracted special attention when, in 1956, at Rocky Point, Mossman, grub damage appeared in maturing plant crops in autumn, where 90 lb. of 20 per cent. BHC had been applied in the half-open drill when the cane was about three months old. The fields yielded only 10 to 11 tons of badly damaged cane per acre, instead of the potential 35 to 40. An investigation which followed disclosed a departure from the expected life cycle and an examination of a large number of grubs dug periodically from the affected stools revealed that this species attained its third larval instar three months after beetle emergence and attacked the cane shortly afterwards. On the other hand, second instar consobrina grubs and second instar frenchi grubs were found in April, 1957, on the Northern Sugar Experiment Station near Gordonvale, indicating that both species were following the two-year life cycle previously observed. It is of interest that a pasture-frequenting Melolonthid in Southern Queensland, *Rhopaea magnicornis*, Blkb., which normally has a third-instar period of 12 months and completes its cycle in two years, may sometimes lessen that period to 6 months and thereby occupy a one-year life cycle. The generation of consobrina now present at Mossman will be kept under observation to detect any similar behaviour.

Soil moisture remained at a high level at Rocky Point, Mossman, in 1957 and the plant crop in a BHC trial there did not suffer devastation similar to that observed in 1956. The untreated controls gave a mean yield of 38.7 tons per acre. The mean yield from all BHC treatments (75, 90, 105 and 120 lb. of 20 per cent. BHC per acre) was 44.6. The difference was significant at the one per cent. level. There was no progressive increase in yield from higher rates of application of BHC. The interpretation of the trial results presents some difficulty in view of collateral field observations that some grubs were still present in the interspaces and a smaller proportion were close to or under the stools. Although yields did not increase with rates of application of BHC it is doubtful

whether complete protection was obtained at any level of application. All the cane treated with BHC was badly lodged; a few rows near the trial, which had an experimental application of a soil fumigant superimposed on a 110 lb. per acre application of 20 per cent. BHC, were conspicuously erect, but the fumigated area was insufficient for a comparison of yields to be made. An unsatisfactory feature of the trial was the number of grubs that survived because they remained in the interspace, outside the bands of BHC; having attained the third instar these would be relatively resistant to the insecticide. Further trials have been initiated employing a wider range of quantities and methods of application, to offset that behaviour.

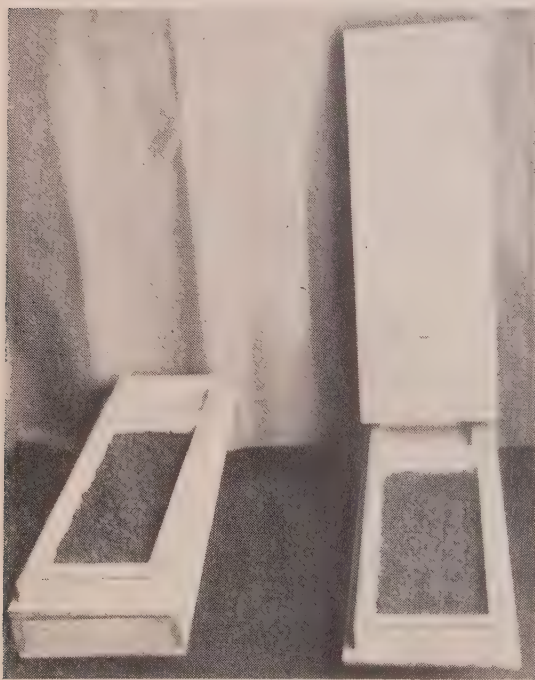


Fig. 51—Plaster of Paris formicaria used for studying the funnel ant; size 17" x 5" x 1". Water seeps from the smaller compartment into the cage proper, which is covered with glass and plywood to exclude light.

In pot tests against first and second stage grubs gamma BHC at 4, 8 and 16 parts per million of soil caused mortalities of 83-92 per cent. in an 11-day period, while at similar concentrations aldrin and dieldrin gave 25 per cent.

When third stage grubs were treated during a 20-day period with gamma BHC at 4, 8, 16 and 32 ppm. the mortalities were 35, 65, 88 and 88 per cent. respectively. Aldrin, dieldrin, endrin, chlordane and DDT were relatively ineffective.

In the Mossman area consobrina grubs were not confined to Rocky Point, but occurred also at Mango Park, Bonny Doone and along the Cook Highway about four miles south. They destroyed a total of 1,500 tons on 90 acres. Some fields of ratoons were almost a total loss where BHC had been applied only on the plant crop, and moderate damage was observed where a 75 lb. application of 20 per cent. BHC per acre had been supplemented by a similar amount on the first ratoons. An infestation on two acres on a Hambledon farm, where no BHC had been used, destroyed 50 tons of cane.

THE FUNNEL ANT, *Aphaenogaster pythia*, Forel

The funnel ant persists as a pest of cane at Tully and Mossman, where its subterranean activities weaken the cane stools, particularly in ratoons. In a soil insecticide field trial neither aldrin (which gave significant increases in yield in plant and first ratoon crops of another trial in the two preceding years) nor BHC increased the plant crop yield. The soil fertility had been raised by the application of eight tons of molasses per acre, in addition to a legume crop, and the cane was affected by a severe cyclone at the age of ten months. Possibly these circumstances prevented ant activity from functioning as a growth-limiting factor during 1956, and the ratoon yields are awaited with interest. A second trial, employing aldrin, BHC, chlordane, and parathion was rendered unharvestable by the cyclone but will be weighed as first ratoons. When asexual forms were placed in soil containing aldrin, dieldrin, chlordane, and gamma BHC at a concentration of two parts per million, total mortality was reached in seven to eight days. At 24 parts per million, total mortality was caused by parathion, endrin, aldrin, and gamma BHC in three days, by dieldrin

and chlordane in five days, and by DDT in eight days; the mortality in untreated controls reached 11 per cent. at the eighth day.

A shallow layer of soil in a plaster of paris formicarium allowed the ants' activities to be observed. The ants cut off portions of the roots of young cane plants and lacerated the cut ends, obtaining food or moisture, and sometimes roots were lacerated for food without being broken. This is the first evidence obtained of direct damage to roots. Roots similarly cut and lacerated were subsequently found in the field. Sugar and molasses were consumed in cages, but cereal and meat

one female being 13 in two months. A Homopteron, possibly a Eurybrachid, is commonly carried about by the ants when disturbed, and stroked when at rest.

INSECTS ASSOCIATED WITH POOR RATOONING

Studies in connection with ratoon failures revealed that 90 per cent. of the cases of poor ratooning in the Bundaberg district during the past year were associated chiefly with the presence of larvae of the soldier fly, *Chiromyza rubriceps*, Macq., and to a lesser extent with those of a Chrysomelid beetle, *Rhyparida dimidiata*, Baly. However, there were a number of cases of poor ratoons where no soldier fly larvae were found, and in other instances, particularly on outside rows, stools ratooned quite normally even though infested by these pests, so the role they are playing in this matter has not yet been fully elucidated. The widespread occurrence of *C. rubriceps* at Bundaberg was not unexpected in view of the favourable autumn and early winter rains that fell during the critical period of the insect's cycle during both 1955 and 1956. Conversely since the rainfall in that district during the corresponding period of 1957 was very low it is expected that the pest will revert to one of minor importance this season, except perhaps in irrigated fields.

Flies emerged between April and June, 1957, but heavy populations quickly disappeared and there was little opportunity to study their habits. A proportion of these larvae did not pupate during the autumn months, so the completion of their change to the adult stage will be watched with interest. There was some evidence from an observational trial put down in 1954 that BHC and aldrin (4 lb. active ingredient per acre) were preventing infestation in the second ratoon crop, and in this instance the dusts had been applied broadcast to the surface of the soil and disced in prior to planting. A number of varietal resistance trials did not become infested but there are indications that vigorous ratoons such as C.P.29/116 and N.Co.310 are more likely to produce fair ratoons in the presence of soldier fly larvae than varieties such as Q.50 and Q.55.



Fig. 52—Funnel ants feeding on sugar in a special feeding recess in a plaster of paris formicarium

meals were rejected. Adult females survived in cages for over sixteen weeks, without the attendance of asexuals for the greater part of the period; they were active in constructing tunnels and caring for their eggs and do not appear to be dependent on the asexuals to any important extent. Sexual flights have not been observed, but opportunities for field observation were limited. Oviposition was first noted in May and increased until July; the eggs were laid singly at intervals of a few days, the maximum laid by

Larvae of *R. dimidiata* were responsible for poor germination and poor ratooning on a few farms, but in most cases losses were restricted to relatively small patches in the South Kalkie and Woongarra areas of Bundaberg. Beetles emerged towards the end of January, 1957, and some observations were made on their habits. They were numerous on blue gum and Moreton Bay ash trees where they fed on the foliage and sheltered under the loose bark. It was found that, although the beetles were sluggish during

Various row and broadcast dressings of the more popular soil insecticides have been made on the most heavily infested farms.

MISCELLANEOUS INSECT PESTS

Insect pests other than those described above were of minor importance in 1957. Field trials of soil insecticides against "earth pearls" (*Margarodidae*) were set out where infestations had been heavy and crops appeared to have been affected, but infestations showed a marked decline and the yields may not prove informative. Several species were collected from nine localities for identification, some of the life stages required being bred out in the laboratory. Laboratory and field observations on material from four sites disclosed that adult emergence commenced in October and continued for some weeks; on one site which was regularly inspected emergence continued from October to February. Three to ten days after emergence the female commenced exuding waxy filaments into a small soil cavity prepared for oviposition; exudation continued for one to four days, after which 100 to 600 eggs per female were laid over periods of one to two weeks. The eggs were laid in the one cavity and the female died beside the eggs. Eggs hatched in 14 to 19 days. The transformation of the larvae from the crawler to the encysted state was difficult to observe, but took place within three weeks in one species.

The caudata beetle, *Lepidiota caudata*, Blkb., which has a two-year life cycle, flew in large numbers in several sections of the Babinda area in September, 1956. Third stage larvae attacked a small proportion of stools in young plant cane. Larvae of the Christmas beetle, *Anoplognathus boisduvali*, Boisd., denuded young plant cane of roots on several acres of very sandy soil near Mossman. The primary shoots were lightly eaten into near the setts, and the grubs burrowed deeply into the plants. The black beetle, *Metanastes vulgivagus*, Ollif., continued to infest young plant cane on a few farms near Mourilyan township; infestation was heavier where panicum grass (*B. mutica*) had been dense on the preceding fallow. The beetle borer, *Rhabdoscelus obscurus*, Boisd., was prevalent in



Fig. 53—Roots cut by funnel ants in a formicarium. The edge of a sett can be seen on the margin of the photograph, with some lacerated roots attached.

the day, activity quickened towards dusk when mating was observed. No egg-laying was seen either in the field or in the laboratory, and examinations of soil in possible infested areas have so far failed to reveal eggs.

only three mill areas, but it was doubtful whether there was measurable loss caused in the cane. It is known that thorough desiccation of cane debris on the surface of the soil is a valuable control, and as the three areas affected lie in the heavy rainfall belt (140 inches per annum) the prevalence of borers is attributed to the difficulty of maintaining good field hygiene. Outbreak of army worms, *Pseudaletia unipuncta*, Haw, and *Laphygma exempta*, Wlk., were of low intensity and transient. Germinating cane was damaged by wireworms, *Lacon variabilis*, Cand., on only a few fields where BHC applications were omitted or inadequately applied. At Plane Creek a three-acre planting was a complete failure, in the absence of any BHC dressing. In the North Isis area dry conditions assisted the scale insect, *Aulacaspis madiunensis*, Zehnt., to develop into a very heavy infestation on a block of standover C.P.29/116 there.

Microscopic Soil Arthropods

The estimation of populations of microscopic soil Arthropods was continued from the previous year at monthly intervals until September. No

co-relation could be detected between populations and seasonal conditions or soil content. The classification of the material is hampered by the paucity of previous work on Australian soil fauna, particularly amongst the mites. Acarinae found have been given the following generic identification: *Digamasellus*; *Uroobovella*; *Oppia*. (three spp.); *Scheloribates*; *Galumna*; *Epilohmannia*; *Nanhermannia*. Other organisms identified were a Japygid, *Parajapyx queenslandia*, Womersley, and two Pauropods, *Allopauropus aegyptiacus*, Remy, and *A. tennuls*, Remy. Whether the microscopic soil fauna has any effect on cane production is a matter of some interest. Following reports from Louisiana that, on heavy soils, chlordane applied near the plants increased yields in the absence of any recognisable insect pest, trials were put down on three heavy soils in North Queensland, in which aldrin, dieldrin, chlordane, and BHC were applied at planting time. One plant crop has been harvested in which no significant increase in yield resulted from any of the insecticides.

ANIMAL AND BIRD PESTS

The estimated loss of cane in the 1956 crop due to rat damage was 40,000 tons, a decrease of 20,000 tons by comparison with the 1955 crop. The loss in the 1957 crop can only be predicted on the basis of rat activity during the first month of harvest; forecasts from the various districts aggregate 34,000 tons. In most mill areas rats appear to be less active than last year, but in Central Queensland they are obviously on the increase and losses are expected to equal those experienced in 1941 and 1955. At Ingham rat damage may equal that seen in 1956. Where rat damage has remained at a relatively high level it cannot be attributed to any falling off in efforts at control; on the contrary, Cane Pest and Disease Control Boards have intensified their activities and increased their expenditure on poison bait. The persistence of rat attack reflects the difficulty of controlling wild fauna in an environment which is essentially favourable to their survival.

Wild pigs destroyed a few hundred tons of cane at Mossman, Hambleton, Mulgrave and



Fig. 54—The nymph of a homopterous insect which is attended by the funnel ant. Actual size.

Tully. Wallabies were not a serious pest, although they were plentiful in Central Queens-



Fig. 55—Boxes with detachable sides allow development of earth pearls on the roots of young cane to be watched.

land; the beagle hound is now a standard means of keeping them away from cane fields, and in addition, hunters in the Plane Creek area were paid bounty on 2,691 scalps. Beagles were also credited with driving off hares in the Gin Gin district where they had been eating cane. Fox damage was substantial on individual farms in South Queensland and several of these animals were accounted for where fish-head baits poisoned with strychnine were set out near the damaged cane. Attempts were made to capture specimens of the wild fauna that damage mature cane on the borders of rain forest but specimens of the Queensland Striped Phalanger, *Dactylopsila picata*, Thomas, which is suspect, were not obtained. Cockatoos damaged some cane on the borders of forest land at Proserpine. The bald coot did only minor damage in any area.



Fig. 56—Droopy top can be serious on sandy soils. This field is at Mossman.

Disease Investigations

C. G. Hughes, Senior Pathologist

Ratoon Stunting Disease

Ratoon stunting disease yield trials harvested during the 1956 season again showed considerable losses due to the disease in a number of important varieties. These losses are summarised in the table below. The varieties P.O.J. 2878, Pindar, Q.47, S.J.4, and Vidar all suffered losses of 20 per cent. and over. Losses in Trojan this year were less than previously, the seven trials harvested averaging a loss of 9.6 per cent. cane; however, individual losses were up to 23 per cent. Q.50 showed losses in two of the four trials, and it would appear that under certain conditions this variety can suffer losses from the disease.

C.c.s. determinations were again carried out on most of these trials, and the figures indicate that the disease has little or no effect on sugar

content. The proportionate losses of cane and sugar due to the disease are therefore approximately equal.

A number of grasses which commonly occur in cane fields have been artificially infected with the ratoon stunting disease virus. They showed no observable symptoms, although the disease was easily transmitted from them back to the sugar-cane variety Q.28. These grasses include:—

Brachiaria miliiformis (Presl.) Chase — Green summer grass.

Brachiaria mulica (Forsk.) Stapf. — Para grass.

Chloris gayana Kunth. — Rhodes grass.

Cynodon dactylon (L.) Pers. — Couch grass.

Echinochloa colonum (L.) Link.—Barnyard grass.

Imperata cylindrica (L.) Beauv. — Blady grass.

Panicum maximum Jacq. — Guinea grass.

Rhynchelytrum repens (Willd.) C.E. Hubbard — Red Natal grass.

Cane Sugar

Sorghum verticilliflorum Stapf. — Wild sorghum.

Sporobolus capensis (Willd.) Kunth. — Parramatta grass.



Fig. 57—Occasional ratoon fields still show the effect of ratoon stunting disease. Note poor ratooning in infected alternate rows on right.

Four other grasses, viz., *Paspalum dilatatum* Poir., *Paspalum paniculatum* L., *Phragmites communis* Trin., and *Pennisetum clandestinum* Hochst., together with a number of dicotyledons commonly used as virus indicator plants were also inoculated, but failed to become infected.

Further experiments with the sterilization of cane knives contaminated with the ratoon stunt-

ing disease virus have shown that such knives can be effectively sterilized by swabbing or scrubbing until free from any obvious adhering matter in the following:—

“Mirrol” or “Zephiran” — 0.1 per cent. active ingredient.

“Dettol” — 1 per cent. commercial product.

“Lysol” — 2 per cent. commercial product and then soaking in these solutions for periods of one to five minutes. Treatments for less than one minute were not completely effective. However in practice it is recommended that the soaking period be extended to at least five minutes to allow a reasonable safety margin.

As a result of reports from field officers of the Colonial Sugar Refining Company in North Queensland that an increased resistance to hot-water treatment was obtained when planting material was cut some days before treatment, two experiments were set out in an attempt to confirm these findings. A trial at Bundaberg included the heat-sensitive variety Q.55, and one at Meringa was carried out with the variety Trojan. In both experiments cane was cut and trashed, then left lying in the field for periods of up to nine days, after which it was cut into setts, hot water treated for three hours at 50°C., and planted. In the Bundaberg trial which was carried out in the early spring, there was a

Percentage losses of cane and sugar due to ratoon stunting disease.

Variety	Crop	Number of Trials	Average Percentage Loss	
			Cane	Sugar
Badila	Ratoon	3	11.7	—
C.P.29/116	Plant	1	-12.7	-16.3
C.P.29/116	Ratoon	2	1.0	—
Comus	Ratoon	1	6.7	4.3
N.Co.310	Ratoon	2	12.4	17.8
P.O.J.2878	Ratoon	2	21.4	21.9
P.O.J.2878	Plant	1	-15.9	-17.2
Pindar	Ratoon	4	21.3	19.7
Q.47	Plant	1	10.0	7.9
Q.47	Ratoon	2	21.0	18.7
Q.50	Ratoon	4	8.8	7.5
Q.56	Ratoon	1	11.2	—
Q.57	Ratoon	2	7.9	8.3
S.J.4	Ratoon	1	21.8	17.9
S.J.16	Ratoon	1	3.2	—
Trojan	Ratoon	2	9.6	11.9
Vesta	Plant	2	13.6	11.4
Vidar	Ratoon	7	25.9	—

significant increase in germination of plants cut for two to nine days before treatment when compared with those treated on the day of cutting or one day later, and there did not appear to be any falling off in germination after periods of up to nine days delay before treatment.

The Meringa trial was planted about six weeks later than the Bundaberg trial when the weather was considerably warmer. In this case best germinations were obtained with cane which was cut three or four days prior to treatment, after which there was a falling off in germination.

Various attempts to concentrate or purify the ratoon stunting disease virus, following techniques used for a number of other plant viruses, have been unsuccessful. However, dilution in-

oculations with sap from various parts of the cane plant have indicated that the virus is most concentrated in mature leaves, leaf sheaths and stems, slightly less concentrated in roots, and still less concentrated in immature stems and leaves. The maximum dilution found to be infective was 1:25,000. A series of dilution inoculations from frozen infected juice has already shown that the virus can survive for at least 138 days at a temperature of approximately -20°C ., although there was a marked falling off in infectivity of juice stored for 80 to 97 days.

An agar diffusion experiment showed that the infective particles of the ratoon stunting disease virus could move through an agar gel; this could be of importance in serological work.



Fig. 58—Bacterial mottle, a new disease of cane, produces a mottling and streaking on the leaves.

Healthy and diseased setts of Q.28 have been forwarded to Professor E. van Slogteren, Lisse, Holland, for propagation and subsequent examination by serological methods.

Bacterial Mottle

The name "bacterial mottle" has been applied to a new bacterial disease of sugar cane found in flood-liable areas in North Queensland. The disease has been known for some time in the Herbert River area but recently has also been found at Giru and Mackay. Pathogenicity tests have proved the parasitic nature of the multi-flagellate rod which swarms in diseased tissue.



Fig. 59—Stools affected with bacterial mottle are severely stunted.

The disease is not serious at the moment with the present varieties and is confined to fields which have been flooded. Diseased stools very frequently succumb to attack and diseased setts usually produce only weak, short-lived shoots, so that there does not appear to be any danger of a wide build-up of infection. The percentage stool infection in diseased blocks is usually low.

Early symptoms of the disease consist of regular cream-green stripes which, developing orange to rusty-red areas later, then closely resemble those due to downy mildew. Growth of

the infected shoot slows, the young leaves develop a chlorotic mottling and the aging leaves wither at the tips and edges and curl inwards. Infected shoots usually die, but a stalk of reasonable size will frequently produce numerous basal side shoots, all of which show the characteristic mottling. Internally, diseased stalks show brown necrotic areas which may break down to form small pockets containing droplets of a gummy substance.

An article on the disease has been published or submitted for publication in local and overseas sugar journals so that cane pathologists everywhere may be alerted to be on the watch for it.

Downy Mildew

(*Sclerospora sacchari* Miy.)

The farm at South Kalkie in the Bundaberg district where an outbreak of downy mildew disease was discovered in April, 1956, has been kept under close observation. The disease does not appear to have spread beyond the one farm and on it only 11 diseased stools were found during the 1956-57 season. All these were found in the one block, which was young plant cane when the original outbreak was found. Other blocks on the same and neighbouring farms, the cropping of which also overlapped the blocks diseased last year, have remained free from the disease.



Fig. 60—Disease resistance trials at the Pathology Farm have to be hand planted.

The outbreak at Bundaberg made imperative the testing for resistance of all advanced seedlings — the reactions of local commercial canes were already known — and the trial planted during the spring of 1956 at the Pathology Farm included a number of them. Growing conditions during spring and early summer were excellent and although the trial suffered from the later dry weather, an adequate amount of disease developed. Results are detailed below:—

Variety					Percentage Infected Stalks
Co.475	..	..	..	..	59
I.102	..	..	..	..	3
I.106	..	..	..	..	5
L.46	..	..	..	..	17
L.74	..	..	..	..	6
L.76	..	..	..	..	4
L.77	..	..	..	..	8
L.79	..	..	..	..	1
Luna	..	..	..	..	0
M.83	..	..	..	..	12
M.98	..	..	..	..	0
M.113	..	..	..	..	37
Q.61	..	..	..	..	16
Q.63	..	..	..	..	2
Q.64	..	..	..	..	2
Q.65	..	..	..	..	5
Q.66	..	..	..	..	61
Q.70	..	..	..	..	1
Sirius	..	..	..	..	11
Standards—					
K.338	..	..	..	..	88
P.O.J.2878	..	..	..	..	27
Trojan	..	..	..	..	7
Vesta	..	..	..	..	21

It is obvious that Co.475 and Q.66 — which latter seems to be susceptible to most Queensland diseases — could not be grown in the presence of downy mildew disease.

Leaf-Scald Disease
(*Bacterium albidineans* Ashby)

The leaf-scald resistance trial at the Pathology Farm was inoculated at ratooning and came

away satisfactorily. Adequate disease developed early in the summer and, although there was little subsequent increase and no development of the acute stage by the end of winter, the resistance of the canes under test could be adequately



Fig. 61—In Fiji disease resistance trials the varieties under test are ratooned before the guard rows so that there will be continuous cover for the leaf hoppers.

assessed. The results showed obviously the resistance of Luna and the extreme susceptibility of Q.66 to the disease. Certain of the northern "M" seedlings also showed susceptibility. Results were as follows:—

Variety					Percentage Infected Stools
J.28	..	..	..	..	18
J.64	..	..	..	..	37
Luna	..	..	..	..	0
M.614	..	..	..	..	30
M.615	..	..	..	..	19
M.619	..	..	..	..	36
M.620	..	..	..	..	5
M.631	..	..	..	..	22
M.657	..	..	..	..	18
M.672	..	..	..	..	18
M.699	..	..	..	..	5
M.701	..	..	..	..	8
M.704	..	..	..	..	48

Variety					Percentage Infected Stools
M.720	..	..	..	..	16
M.726	..	..	..	..	69
M.748	..	..	..	..	17
M.752	..	..	..	..	27
M.756	..	..	..	..	23
M.760	..	..	..	..	17
41M.Q.1458	..	..	..	..	11
P.O.J.2878	..	..	..	..	3
Q.57	..	..	..	..	37
Q.62	..	..	..	..	18
Q.63	..	..	..	..	8
Q.66	..	..	..	..	98
Q.70	..	..	..	..	6
Standards—					
H.Q.426	..	..	..	..	62
Mahona	..	..	..	..	66
Orambo	..	..	..	..	44
Q.44	..	..	..	..	57
Trojan	..	..	..	..	20

disconcerting amount in late, immature suckers, which is rather an unusual expression of the disease.



Fig. 62—*Sclerophthora* disease occurs in flood-liable fields at Moore Park, a new cane area supplying Fairymead.

Red Rot

(*Physalospora tucumanensis* (Went) Speg.)

Red-rot disease is not normally important commercially in Queensland because susceptible varieties are not allowed to go into extensive production. However, the disease does at times cause serious interference with the breeding programme. Usually selections have to be made from the early propagations at a time when the disease has not developed fully. Thus it is that a variety can sometimes reach the first stages of commercial production before its field resistance to the disease is determined. This happened to the promising new Bundaberg seedling Q.62 during the spring of 1956. It then showed itself to be very susceptible and was abandoned. A similar fate befell Co.475 in South Queensland. In the North, where the variety also shows promise and where red rot is not usually a problem, the cane is being kept under close observation. It has as yet developed very little red rot there in mature stalks but is showing a

Possible interference to the breeding work was also highlighted by inspections made in original seedlings of the 54 series at Bundaberg in late spring 1956, i.e., some time after the selected seedlings had been planted for further propagation. All seedlings were not available for the later examination but of the 94 sliced, approximately 45 per cent, were found to be infected with red rot to such an extent as to cause commercial damage.

Fiji Disease (Virus)

It would be premature as yet to claim that Fiji disease has been eliminated from the South Queensland districts of Bundaberg, Isis, Maryborough and Moreton but once again the year's detailed inspections have failed to reveal any disease in the previously affected localities, even though susceptible varieties are being grown without restriction. However, in the Rocky Point area, south of Brisbane, where farms are very small and many farmers regard cane pro-



Fig. 63—A Phytophthora caused this damage in a well-grown crop of velvet beans in the Mulgrave mill area.

duction as a side line to other sources of revenue, some disease continues. There eight stools were rogued from three acres spread over five fields on a total of four farms.

The Fiji disease resistance trial at the Pathology Farm encountered dry conditions during the growing period of the second season, i.e., in the ratoon crop, and, despite some irrigation, a poor crop resulted. There was no doubt about the susceptibility of at least two seedlings but the comparatively low incidence of disease in the standard P.O.J.2878 made it difficult to assess resistance.

Chlorotic Streak

Chlorotic streak disease investigations have not revealed either the causal organism or the method of spread but they are being continued into these and other aspects of the disease.

In the field the disease has caused particular concern in the Bundaberg area. There the pat-

tern of an inexplicable rapid spread after a first discovery of a limited infection, such as was seen



Fig. 64—Although gumming disease is now extinct in Queensland commercial fields, trials of advanced seedlings are still carried out. Each shoot is inoculated by pricking.



Fig. 65—Poor growth in patches on certain Burdekin farms has not yet been explained.

at Mackay a few years ago, was repeated. The initial infection was found in one stool at Fairymead in November, 1955, and repeated surveys of all other likely areas in the district did not reveal any more disease that season. However, approximately twelve months later it was found on other blocks on the same plantation as well as on other properties which were in many instances quite remote from Fairymead and had never been planted with material from that locality. The disease is now known to occur on 25 farms or plantations on a range of soils and on different watersheds. The only common denominators appear to be the weather and, usually, comparatively moist soil conditions.

New Guinea Cane Collecting Expedition

Although the Bureau did not have a representative in the field with the Warner-Grassl New Guinea Expedition, it assisted to the full by supplying packing materials and labels and

by arranging quarantine facilities in Queensland. The canes were forwarded to Cairns, where the Commonwealth quarantine service gave every assistance, and taken delivery of by a Bureau Pathologist. They were then treated in hot water and mercurial and taken for planting on the property of a pineapple farmer at Horseshoe Bay on Magnetic Island, some seven miles off the North Queensland city of Townsville. There is no commercial cane on the island or for some miles on the mainland opposite, and the site appears to be ideal for the quarantine. The growing plants are periodically inspected for disease, and methodical sprayings of insecticide prevent the establishment of any insect which might act as a vector of any disease happening to appear.

A total of 254 varieties was received from March to June, 1957, and except for some delayed by an airline strike, most batches, even those from remote places, opened in very good

condition. The majority of the canes have now germinated and are making satisfactory growth.

Miscellaneous

The possibility that there might be confusion between bacterial mottle and *sclerophthora* disease — they both occur in the same flood-labile situations — led to a re-examination of the disease occurring in many localized areas throughout the sugar belt. No new records of bacterial mottle were reported following this, but *sclerophthora* was found infecting several grasses, two of which were fresh records. The



Fig. 66—An unusual variant of the pre-planting mercurial treatment of setts. They are loaded into the watertight planter box and the solution poured over them from buckets. The solution is recovered through taps at the base.

grasses previously found diseased were wild sorghum (*Sorghum verticilliflorum* Stapf.) and elephant grass (*Pennisetum purpureum* Schum.), although in the latter oospores of the fungus have not been found. New records were for summer grass (*Digitaria sanguinalis* Scop.), and guinea grass (*Panicum maximum* Jacq.).

Isolations from wilted green manure plants in the field showed that a *Fusarium* was responsible for the trouble in a cowpea at Bundaberg, while a *Phytophthora* caused death in a field in the Mulgrave area. The *Fusarium* was similar to that found previously at intervals in legumes

of the cowpea group. The *Phytophthora* attack which occurred only in a single patch, is the first recorded locally by that genus on the popular velvet beans. Cultures of the causal agent forwarded to the Commonwealth Mycological Institute were identified as *P. drechsleri*. An unidentified fungus was responsible this year for some premature deaths in another field in the Mulgrave area but, apart from these records, some *Cercospora* leaf damage and a little-leaf type virus infection, velvet beans have generally been remarkably healthy and have continued growing right into the winter.

The Pathology Farm on Warrigal Road, Eight Mile Plains, some 11 miles from Head Office, continues as an important unit of the Division. Resistance trials conducted there during the year included those for leaf-scald, Fiji, red-rot, ratoon stunting, and downy mildew diseases. In addition, investigational plantings were made in connection with rhizobium strains, pineapple disease control and minor miscellaneous diseases as well as ratoon stunting disease.

Improvements effected included the erection of a steel and galvanised-iron, prefabricated building and the installation in it of the laboratory mill transferred from the Department of Agriculture and Stock building in the city. Approximately eight and a half acres adjoining Warrigal Road were cleared of timber and poor regrowth for the planting of decoratives and *Pinus elliotti*; however, the continued summer-autumn drought prevented the planting and it has been postponed until next February.

Visitors to the Pathology Farm included overseas workers as well as local individuals and groups. Mr. C. F. Pollock, field manager of the Tongaat Sugar Co. of South Africa, called during spring, 1956, while on an inspectional tour of the Queensland sugar industry. Dr. C. A. Wismer, Senior Pathologist with the Hawaiian Sugar Planters' Association, came on to Australia after inspecting disease trials in Fiji. In addition to visiting the Farm, he accompanied a senior pathologist on an industry-wide trip. Students of the Central Technical College attended the farm as part of their course for the Diploma in Sugar Chemistry and the recently



Fig. 67—Dr. C. A. Wismer, of Hawaii, photographs a cane specimen held by Mr. D. R. L. Steindl.

formed Pathology Discussion Group, which includes plant pathologists from several organisations, also met there for a field day.

Quarantine House

Most important cane sugar producing countries have established breeding stations which supply a continual stream of new varieties suited to the local conditions. However, it frequently happens that a variety may give promise, either for breeding or for commercial purposes, outside its country of origin and the comparatively free international exchange of varieties is a characteristic feature of the modern sugar world. The Bureau is particularly active in this regard

and during the year under review several parcels of local canes were sent overseas; importations totalled 31 canes which came from British West Indies, Hawaii, Java, Mauritius, Reunion and the United States of America. In addition, five canes were brought in from New South Wales. The main planting in the quarantine house was made in the spring of 1956 and a secondary, the product of which will be replanted for a further quarantine period, during the summer. Growth within the house was generally very good although the variety B.47-258 was markedly sensitive to "Systox" applied to the soil, and a P.O.J. cane had to be destroyed when it developed an unidentified freckle.

Division of Mill Technology

J. H. Nicklin, Chief Technologist (Engineer)
and

L. R. Brain, Senior Mill Technologist

Staff

The staff of the Division was increased by the addition of Mr. E. D. Jensen, Assistant Mill Technologist, who is attached to the Southern Sugar Experiment Station, Bundaberg. Mr. B. G. Adkins was transferred from Bundaberg to Meringa and from that Station he will keep in close contact with the mills in the far north.

Laboratory Work

As official certifying laboratory for the industry, the Division of Mill Technology is called upon to examine and certify an increasing amount of equipment for use in sugar mill laboratories. During the year certificates were issued for 635 brix spindles, 85 flasks, 46 pipettes, 42 thermometers, 2 sets of weights, 1 balance, 42 saccharimeter tubes, 10 quartz control plates, and 3 refractometers. In addition, 9 saccharimeters were overhauled and certified for accuracy and 3 eyepiece micro-meters for pan stage microscopes were calibrated. On the analytical side, 3 samples of molasses were analysed and 4 samples of Horne's dry lead were checked for conformity with the standard grade to be used in juice analysis.

An enquiry was received from one section of the industry to certify apparatus for sugar analysis to A class standard. The laboratory was subsequently inspected by a representative of the National Association of Testing Authorities and was certified to check flasks (to 100 ml.) and pipettes (to 100 ml.) to A class standard. It is anticipated that at a later date, certification will be obtained for checking weights to A class.

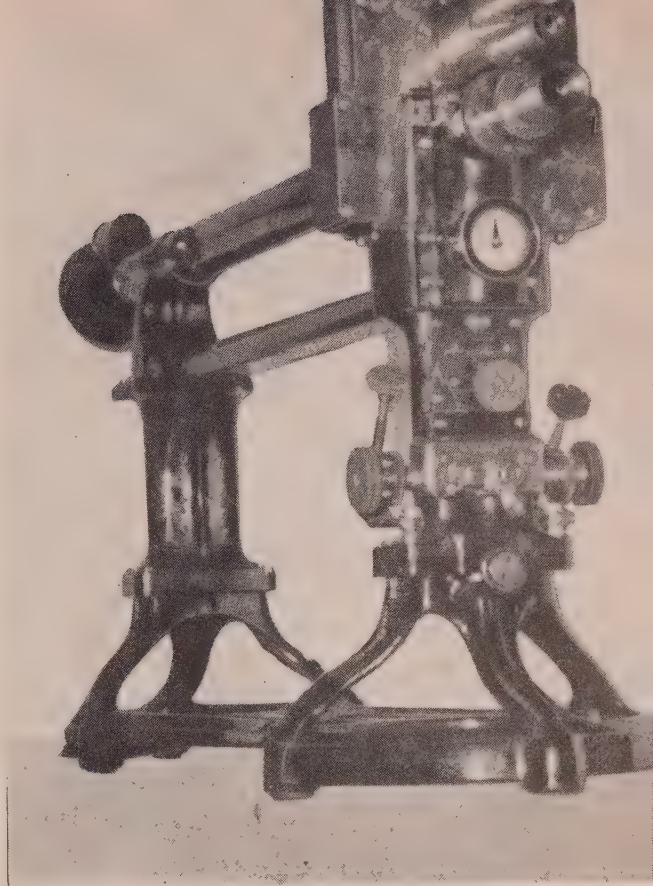


Fig. 68—The Bates Fric Saccharimeter (400 m.m. trough) in use by the Bureau for standardisation work.

Pilot Plant for Wax Extraction

Following the unsatisfactory operation of the batch pilot plant working on a mud slurry, a number of improvements were incorporated in the extractor, mainly to promote better solid-liquid contact. These improvements included an increase in the intensity of agitation by increasing the speed of the stirrer and installing baffles, and also the provision of a star type distributor in the bottom of the extractor instead of the straight type previously used. The steam connection to the jacket was altered to give more uniform heat distribution and a concentric tube heater replaced the coil formerly used for solvent heating.

A number of trials conducted showed that, for the particular extractor used, a maximum extraction was obtained at a solvent rate of 5 to 10 gallons per hour. Above this rate, the

solid-liquid contact was apparently reduced and extraction dropped. Extraction increased markedly with the intensity of agitation and there appeared to be little advantage in operating at a solvent temperature above 50°C. The moisture in the mud slurry proved to be an important variable and the results showed that a moisture content of approximately 80 per cent, gave the maximum extraction.

Severe emulsification occurred during one test when primary mud was substituted for filter mud, indicating that the extraction of wax from mud before filtration is not feasible with the present pilot plant.

The maximum extraction found during the tests was 93 per cent, which was very encouraging. The logical development would be an investigation of a plant working on a continuous basis but, at the present, the market for wax is not bright and the project will probably be shelved until the possibilities of marketing success are a little more encouraging. This success might best be obtained by further treating the crude material so as to produce a hard, light-coloured, refined wax.

The sugar industry must be grateful to the C.S.I.R.O. for the valuable research it continues to carry out on cane wax. It has succeeded in producing a very attractive refined material from the unattractive crude, and is now concerned with the development of formulations in which this refined wax will be the basic component. The provision of such formulations would enable those interested to know exactly what can be done with cane wax and should be of tremendous help in creating a market.

Stockfeed Investigations

The co-operative project of the production of bagasse/molasses stockfeed with the Fairymead Sugar Company was held up as it was not possible to have the plant constructed during the 1956 season. However, construction of a pilot plant is now proceeding satisfactorily at Fairymead and the plant will be operating during the coming season. Bureau officers will assist in operating the plant.

As an essential project in the design of this pilot plant, some experimental work was conducted on the mixing of bagasse and molasses in a sugar screw. By modifying the ribbon of this screw by the addition of rubbing shoes, a successful mixer was evolved and will be included in the pilot plant. With this mixer, a half ton of stockfeed (70/30 molasses/bagasse)



Fig. 69—A sugar screw in use for the preparation of bagasse-molasses stockfeeds.

was prepared and supplied to the Animal Research Institute for preliminary experiments prior to an extensive trial during which stockfeed prepared at Fairymead will be used. Urea will be investigated as a source of portion of the protein for ruminant animals during this trial.

Inversion of Sucrose in Juice

Clarification of juice is carried out in Queensland at an average pH of about 7; but there are a number of mills which operate at pH values much below this figure and this project was planned in an attempt to determine the losses which can occur through inversion and to determine an economic lower limit for the pH of clarification.

Initially the behaviour of the sucrose and reducing sugars in juice during clarification was studied, and as a further stage of the project the inversion occurring later in the process could be evaluated. Processing at varying values of pH was carried out at Mossman, Inkerman, Plane Creek, Millaquin, and

Bingera, and inversion was not positively established until the pH of clarified juice fell to 5.8. Preliminary laboratory experiments had indicated that, depending on the sample of juice, inversion could be detected below pH values from 6.1 to 6.7, but factory operation showed almost invariably that little inversion occurred during clarification above a value of 5.8.

At Bingera where two tests were conducted at 5.4 and 5.5 pH respectively, inversion was very apparent.

This project will be continued in the laboratory and the factory and the effect of varying pH on processing beyond the clarification station will receive attention.

Crystalliser Studies

As portion of a continuing project, the heat transfer characteristics of the Blanchard crystallisers at Millaquin mill were evaluated late in the 1956 season, i.e., after almost two seasons of service. At this mill both the cooling and reheating waters are conditioned to prevent corrosion and scaling of the cooling surfaces in the crystalliser. The project was designed partly to determine the effectiveness of this treatment.

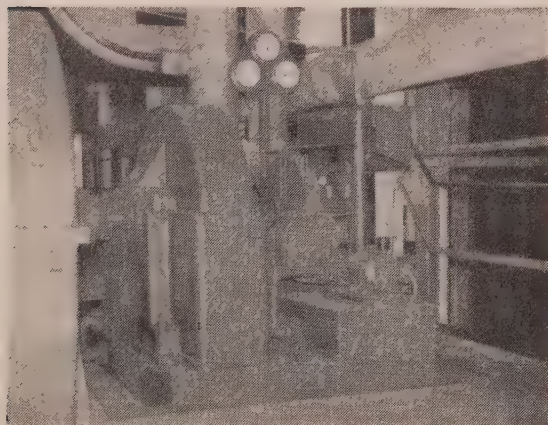


Fig. 70—A neat turbine mill drive at Inkerman mill.

The results indicated that the heat transfer coefficient had risen slightly during the two seasons of operation, showing that the water

treatment was very effective. The average temperature of the massecuite treated had risen appreciably and this factor would tend to increase the coefficient of heat transfer.

Also, during the tests, the water flow was varied between 500 and 2,200 gallons per hour with a negligible effect on the heat transfer, illustrating once again that the massecuite side of the cooling surface imposes by far the greater resistance.

New Type of Fugal Linings

A new type of fugal lining incorporating a stab backing and a slotted screen was installed on a Roberts fugal at Fairymead, and a series of tests was conducted to compare its performance with that of a normal screen.

This series and a previous series of tests by the staff at Fairymead showed that there was no noticeable benefit to be gained from the use of the new screen either in the effective capacity of the fugal or in the purity of the molasses. However, the performance of the new lining was compared with that of a normal lining fitted with a semi-stab backing with both fugals operating at 1800 r.p.m. With fugals operating at lower speeds and normally fitted with a gauze backing, some advantage might become evident. The investigation will be continued along these lines.

Investigation of Cane Payment System

During the last few years, a number of requests have been received from various sections of the industry to investigate specific aspects of the cane payment system. The Bureau was not prepared to investigate the system in any specific phase and was of the opinion that, if any investigation were necessary, the entire payment system should be reviewed.

The Central Sugar Cane Prices Board and the Sugar Experiment Stations Board considered the problem and appointed a committee consisting of N. J. King, J. L. Clayton, and L. R. Brain to advise on the necessity for an investigation and, as a result of the report of this committee, the two organisations proposed a co-operative project to look into cane payment



Fig. 71—The movable gantry and chute for the delivery of raw sugar to the ship's hold at the Mackay bulk sugar terminal.

in Queensland. This committee interviewed representatives of the Sugar Research Institute, the Proprietary Millers' Association, the Colonial Sugar Refining Company, the Queensland Cane Growers' Council and the University of Queensland. The opinions of these organisations were taken into consideration when the initial stages of the project were planned.

There has been considerable discussion on the correctness of the 3 and 5 factors which are used in the c.c.s. formula and, owing to the fact that very few Queensland mills are equipped with juice scales, there is, at present, no means of determining the true overall value of these factors. It has also been shown that these values can vary with different varieties of cane. Consequently it was thought essential that a method be evolved whereby the overall analysis of cane entering the factory could be

determined and the "disintegrator" devised by the Sugar Research Institute showed promise of being a useful tool.

The work for the 1957 season has been planned to be conducted initially at Pleystowe where juice scales are installed and these scales will be used to check on the accuracy of the analysis of the cane entering the factory. The analysis of cane by the disintegrator has been investigated fairly fully and Bureau officers will train four cane testers in the methods to be used. These cane testers will then maintain a continuous analysis of cane at Pleystowe.

Further work envisaged is the determination of the actual factors used in the c.c.s. formula for the different varieties in all districts. It is hoped that some pattern may become apparent as the work proceeds.

Other aspects for investigation include the effect of the constitution of the impurities on the sugar lost in molasses and the effect of fibre content on the milling loss.

It will readily be appreciated how widespread is an investigation of this type and the project will extend over a number of seasons.

Labour Saving Devices

One of the outstanding features of the Queensland sugar industry is the fact that it is conducted entirely with European labour. The cost of this labour is high and although much more efficient than that of the low wage countries which produce cane sugar, it must be reduced as much as possible if the consumer is to obtain the finished product at a reasonable price and,

at the same time, the grower and miller are to get a reasonable return for their share in the joint effort.

Labour saving devices are not restricted to any particular section of the industry. The well-known "cutter-planter," which is a Queensland invention, has saved farmers many thousands of hours in the initial operation of planting the cane. Mechanical harvesters and loaders are increasing in popularity, while for the final operations of transporting and shipping the finished product, the year under review saw the completion of the tremendous bulk-handling scheme at Mackay.

In the factories themselves the trend is also quite marked. Over the last five years there has been a remarkable increase in crushing rate and this in itself must reduce the number of man hours per ton of sugar produced. A higher crushing rate makes it more difficult to keep a full supply of cane on the carrier and in this direction much attention has been given to mechanical devices for reducing the labour required to bring the loaded trucks up to the carrier and spot them on the cane tip. At Mossman a very ingenious device was put into operation for automatically lubricating the four axle boxes immediately the empty trucks are pushed off the tip. The device was introduced to eliminate an unpleasant manual task and at the same time save money. The latter expectation has been more than realised—with the more efficient lubrication obtained there has been a marked increase in the total weight of cane which each locomotive is able to pull.

Another section of the factory which has received attention is the boiler station. Devices which have been introduced into this section to save labour and/or obtain more efficient operation are automatic water level controllers and continuously dumping grates. The latter, while saving the unpleasant job of cleaning fires at least once each shift, enable the boilers to give their full output continuously.

Large steam boilers in other industries are generally fitted with automatic control such that the fuel and air supplies are automatically

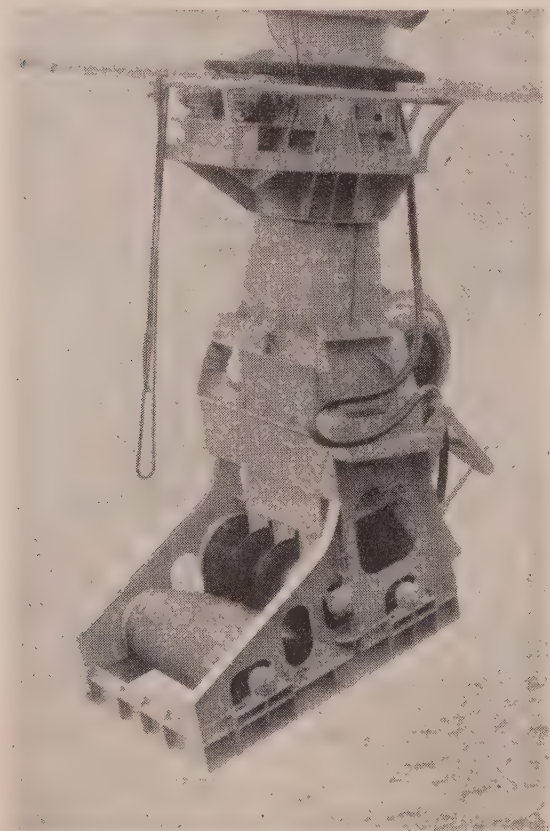


Fig. 73—A close-up of the sugar distributor fitted to the telescopic chute; Mackay bulk sugar terminal.

adjusted to suit the load being taken. This type of control is used in several sugar factories overseas where the tendency is to use much larger steam generating units than is the case in Queensland. Nevertheless, it is considered probable that a modified form could be used to advantage here. The Bureau has investigated the matter and is hopeful that a simplified system of automatic draught control will be tried in one or two of our factories in the near future.

Fly Ash Arresters

Higher crushing rates bring greater steam demands and in nearly all factories it has been found that, even though new boiler plant might have been installed, there has been a definite increase in the rate of evaporation required. This increase in rate is justified by the present-day high cost of boiler plant, but it, unfortunately, tends to increase the nuisance caused by the emission of ash and unburnt carbon from sugar factory smoke stacks. Complete elimination of the nuisance, which has always been associated with the industry, is possible, but would be very expensive. However, it is desirable, particularly in the case of those factories which are situated in or close to towns, that the nuisance should be reduced.

During the 1956 slack season the Millaquin Sugar Company installed fly ash arresters on two of their seven boilers at Millaquin. One of these arresters was a commercial multi-cell type while the other was designed and fabricated at Millaquin. It was of the baffle type and had a much lower installed cost than that of the commercial unit.

Bureau officers had the opportunity of testing the two arresters during the crushing season. A number of tests gave average efficiencies of 78.0 and 68.5 per cent. for the multi-cell and baffle types respectively. Both arresters caught all particles larger than 0.6 mm. in size. These efficiencies might appear a little disappointing, but it must be remembered that the large particles make by far the greatest contribution to the bagasse nuisance.

Another method of dealing with the problem has been adopted at South Johnstone. Here

the flue gases from each boiler are taken into a large brick and concrete chamber, 15 feet high and 7 feet wide, running along near the backs of the boilers and connected at one end to the fan. A stream of water, properly sealed at the outlet end, runs continuously along the sloping floor of the chamber. At each boiler inlet a steel plate deflects the gases down to the surface of the water and suspended particles tend to be thrown into the water. The reduced velocity of the gases in the chamber would also tend to drop particles into the water stream.

It would, unfortunately, be almost impossible to test the actual efficiency of the South Johnstone arrester, but the results obtained, judged by observation, are reported to be quite good.

Paper and Hardboard from Bagasse

In addition to its use as a constituent in stockfeed, the investigation of other ways of profitably using surplus bagasse — and many thousands of tons are available each year in the Mackay and Bundaberg districts — has been continued.

In recent times reference may be found almost every month in at least one of the world's sugar journals, to the establishment of a factory for using bagasse as the main raw material in the manufacture of white paper, wrapping paper, newsprint, or hardboard. The fact that these projects are in such widely-spread places as Taiwan, South Africa, Louisiana, Cuba, and Brazil strengthens the feeling that surplus bagasse can be profitably used in Queensland.

Bureau investigations carried out to date indicate that, although a capital expenditure of about £3,000,000 would be required, the manufacture of white paper of good quality is probably the best outlet for surplus bagasse.

The possibility of carrying the process to the half-way stage and producing pulp for sale to an existing paper mill does not appear so promising. Also the capital expenditure, although much less than that required for a paper factory, would still be quite considerable.

The manufacture of hardboard at an individual sugar factory (as against a large central paper or pulp plant) appears feasible. Sufficient information is not yet available to enable plant capital cost to be determined, but it is hoped that this will be under £400,000.

A fourth possibility is the drying, de-pithing, and baling of bagasse for sale to an existing paper or pulp mill. The capital expenditure should be small, but transport costs would probably leave only a small profit margin. However, the separated pith, when mixed with molasses, would make an excellent stockfeed and the combined project might be worth considering for small-scale operation.

General

As is the usual procedure, each mill was visited at least once by a Bureau officer for general discussion and a number of special visits were made for recommendations on processing and equipment.

THE 1956 SEASON

After the decline in production experienced during 1955, an increase in both cane crushed and sugar produced occurred in the 1956 season. Although the crop did not equal the record crop of 1954, 8,978,081 tons of cane were crushed, a crop which was exceeded only by that of 1954. Early forecasts of substantial losses in the northern districts due to a cyclone were not realised and, as an excellent season was experienced by the southern district, the total sugar production of 1,171,870 tons of 94 n.t. sugar slightly exceeded the aggregate of mill peaks by some 970 tons. An increase in the overseas quota due to inadequate production elsewhere avoided the imposition of any restrictions on the amount of cane which could be accepted by the mills.

Cane quality showed a significant increase in both the northern and southern areas while that in the central area exhibited a significant decline, the overall result being a slight fall in c.c.s. of 0.08. The change in cane quality was responsible for the increase in the number of

tons of cane required to manufacture a ton of 94 n.t. sugar. In spite of a slightly higher average mill efficiency, the 1956 figure was 7.661 as against 7.587 in 1955.

The fibre in cane still showed an increase (13.59 in 1956 compared with 13.48 in 1955), but this increase was considerably below that of the previous few years and the fibre figure now appears to be approaching a steady value. However, a determined effort is being made by a number of mills to secure a cleaner cane supply and the effective fibre per cent. cane might conceivably fall due to this factor. The cleanliness of cane has deteriorated appreciably in past years and a return to clean cane must result in improved conditions for all concerned.

Although the average crushing rate was higher in 1956, it was more than offset by the larger crop with the result that 208 more days than in 1955 were required for treating the cane. Industrial disputes, resulting in overtime bans in certain areas, were responsible for some of this increase. These industrial troubles help to explain the rather high figure of 26.96 per cent. which is given for premeditated stops in the analysis of gross time. While the time lost through mechanical troubles showed a slight decrease, time lost through cane supply rose sharply from 2.31 to 5.46 per cent. Wet weather early in the season in the north, and bent cane which resulted in lightly-loaded trucks in both the northern and central districts, were responsible for this increase.

The trend towards higher crushing rates has continued and the average rate has exceeded 100 tons per hour for the first time. When it is realised that the fibre in cane increased by 0.11 from the 1955 value, the increase in average pol extraction of 0.07 is commendable. The crushing rate in the northern district fell to some extent due, no doubt, to the bent condition of the cane, and the pol extraction rose. However, the rise in crushing rate in the central district was accompanied by a rise in extraction, but occasioned a fall in extraction in the southern district. The overall picture of milling in the State is quite bright with devices such as pressure feeders and apron feeders becoming more

and more popular. The pushers, formerly used exclusively for feeding mills, are gradually losing favour. Trouble experienced in the northern area with bent cane highlighted a defect in our system of milling and consideration is now being given to the overseas practice of using feeder carriers to supply cane to the main carrier. Our method of sampling in the cane payment system complicates this approach somewhat but this difficulty should be overcome.

A pleasing feature of the season was the increased efficiency of the mill work, which is shown in both the recovery which increased from 84.89 to 85.59 and in the coefficient of work which rose from 96.88 to 97.20. Coupled with a higher crushing rate, these increases indicate more rigid control on all processing operations. After the upward trend in the purity of final molasses shown in 1955, the purity dropped from 44.17 to 43.89 in 1956, while the expected purity dropped by only 0.1 unit.

Losses in bagasse, molasses and mud have all decreased but the undetermined loss has risen slightly.

Dealing with the system of factory control, four factories are now equipped with juice weighing machines and interest is being displayed by a number of other mills. When our factory control is based on juice weights, much more reliance will be placed on the factory control figures.

Sugar quality has dropped to some extent, as shown by the net titre, which decreased by 0.11 due to an increase in the ash content of the sugar. However, the dilution indicator is now below 40 in all districts with an average value

of 35. With a tightening of control on this factor by the marketing authorities, the dryer stations at the mills are receiving long-overdue attention and a gradual decrease in this figure might be expected.

Included in the sugar manufactured in the southern area are 50,000 tons of low polarising sugar for the Japanese market, which would account largely for the drop in the net titre of sugar reported for that district. The production of this sugar did not cause any manufacturing difficulties although it has been calculated that the coefficient of work of the mills in the southern district was depressed by 0.2 because of it.

The increase in the extraneous fuel used is a direct reflection of the high proportion of lost time due to cane supply, this factor being particularly obvious in the northern area where the increase in fibre in cane could not offset the usage of extraneous fuel.

The 1956 season was very successful technically in that the crushing rate was increased and the efficiency of almost every department showed an improvement. In the large majority of cases, the increases in the rate of processing have not been accompanied by any increases in the number of staff available for supervision, and credit must be given to mill staff for the standard of efficiency achieved. Interest is now being centred on attempts to improve the condition of cane being delivered to the mills and investigations into the payment system for cane. These moves are long overdue as neither grower nor miller are satisfied with the systems in vogue, and results will be awaited with interest.

Table IX—Production Data for Queensland Mills for Seasons 1950-1956 (Totals and Weighted Averages)

Northern District	1950	1951	1952	1953	1954	1955	1956
Cane—							
Tons	2,622,402	2,135,564	3,092,819	3,315,716	3,943,427	3,270,354	3,197,051
Pol per cent.	14.40	15.64	14.84	15.45	13.88	13.55	13.80
Fibre per cent.	10.35	11.26	11.24	11.61	10.93	11.38	11.74
C.C.S.	13.21	14.58	13.70	14.48	12.70	12.36	12.67
Purity 1st expressed juice	87.81	90.08	88.47	89.96	87.20	86.96	87.71
Sugar—							
Tons 94 net titre	344,944	304,786	421,921	467,716	502,276	413,853	406,172
Cane per ton sugar	7.60	7.01	7.40	7.09	7.85	7.90	7.87
Pol per cent.	98.47	98.52	98.66	98.81	98.50	98.60	98.78
Net titre	97.12	97.07	97.33	97.52	97.09	97.33	97.61
Dilution indicator	29.0	28.8	31.3	31.0	30.5	41.0	38.5
Pol per cent. pol cane	85.29	85.39	86.61	85.78	85.17	84.67	86.32
Mud—							
Tons	46,765	38,342	53,197	55,582	63,816	54,285	53,324
Mud per cent. cane	3.10	3.13	2.91	2.95	2.96	3.07	3.19
Pol per cent.	3.66	4.10	4.50	3.55	2.96	3.47	2.40
Pol per cent. pol cane	0.79	0.82	0.90	0.69	0.64	0.79	0.55
Molasses—							
Gallons (1000's)	6,737	4,950	7,905	7,723	10,246	8,243	7,416
Gallons per ton cane	4.48	4.04	4.32	4.17	4.76	4.66	4.43
Brix	86.36	88.82	88.28	89.87	89.78	91.38	90.29
Apparent purity	30.93	33.78	31.66	33.97	32.49	31.87	30.05
True purity	44.73	45.57	43.36	45.71	44.31	44.40	41.82
Expected purity	—	38.36	37.99	38.90	38.0	38.4	37.8
Reducing sugars/ash	—	—	—	—	—	1.90	2.12
Pol per cent. pol cane	5.36	4.86	5.90	5.62	6.74	6.79	5.76
Final Bagasse—							
Tons	335,620	295,620	429,961	446,918	489,784	421,275	404,825
Bagasse per cent. cane	22.26	24.14	23.48	24.24	22.74	23.83	24.19
Pol per cent.	3.04	3.09	2.97	3.03	2.63	2.55	2.37
Dry substance	50.49	51.33	52.30	51.63	51.55	51.39	51.69
Pol per cent. pol cane	4.70	4.77	4.64	4.73	4.31	4.48	4.15
Undetermined loss—							
Pol per cent. pol cane	3.86	4.16	1.95	3.18	3.14	3.47	3.22
Fuels—							
Tons: Wood	8,768	3,847	5,175	5,181	3,498	4,909	9,691
Coal	0	0	0	0	40	42	111
Molasses	16,691	6,577	5,951	1,206	6,982	9,093	9,183

Central District	1950	1951	1952	1953	1954	1955	1956
Cane—							
Tons	2,580,013	1,971,468	2,685,687	3,773,830	4,119,775	3,641,996	3,765,908
Pol per cent.	14.96	16.44	15.95	16.02	15.27	15.56	15.07
Fibre per cent.	12.68	13.35	12.56	12.85	13.36	13.93	14.11
C.C.S.	13.93	15.28	14.80	14.92	14.18	14.39	13.97
Purity first expressed juice	89.60	89.66	89.56	88.82	89.43	88.82	89.24
Sugar—							
Tons 94 net titre	355,751	286,416	388,343	547,648	570,867	509,146	508,238
Cane per ton sugar	7.25	6.88	7.02	6.89	7.22	7.15	7.41
Pol per cent.	98.74	98.52	98.82	98.96	98.91	98.78	98.82
Net titre	97.25	96.81	97.37	97.71	97.58	97.36	97.35
Dilution indicator	29.0	28.2	30.0	29.5	27.7	34.6	32.9
Pol per cent. pol cane	86.73	84.12	86.46	86.24	86.46	85.68	85.46
Mud—							
Tons	81,414	64,799	81,139	133,893	145,162	128,115	136,837
Mud per cent. cane	3.15	3.49	3.33	3.49	3.52	3.52	3.63
Pol per cent.	2.67	3.36	3.21	2.95	2.59	2.54	2.43
Pol per cent. pol cane	0.55	0.71	0.57	0.66	0.60	0.57	0.59
Molasses—							
Gallons (1,000's)	10,681	9,649	12,573	18,690	18,227	17,678	16,215
Gallons per ton cane	4.14	4.89	4.68	4.95	4.42	4.85	4.31
Brix	88.57	90.33	90.45	89.75	90.15	90.94	90.28
Apparent purity	36.17	35.35	34.50	34.62	35.65	34.67	36.08
True purity	45.74	45.01	44.01	44.60	44.19	43.46	44.17
Expected purity	—	40.64	40.80	39.81	40.70	40.30	40.6
Reducing sugars/ash	—	—	—	—	—	1.33	1.25
Pol per cent. pol cane	5.73	5.96	5.92	6.14	6.00	6.27	6.16
Final Bagasse—							
Tons	668,330	552,250	695,837	1,010,347	1,116,182	1,052,025	1,098,190
Bagasse per cent. cane	25.89	27.34	25.91	27.01	27.09	28.89	29.16
Pol per cent.	2.37	2.71	2.60	3.07	2.81	2.87	2.65
Dry substance	51.48	51.71	52.40	51.96	52.67	52.01	52.34
Pol per cent. pol cane	4.04	4.60	4.19	5.11	5.03	5.35	5.13
Undetermined Loss—							
Pol per cent. pol cane	2.95	4.61	2.86	1.85	1.91	2.16	2.66
Fuels—							
Tons: Wood	10,140	5,084	3,822	6,985	3,594	4,053	6,373
Coal	528	225	233	181	81	39	403
Molasses	18	0	0	0	0	0	0

Southern District	1950	1951	1952	1953	1954	1955	1956
Cane—							
Tons	1,489,291	898,140	1,063,030	1,661,517	1,801,103	1,703,813	2,015,122
Pol per cent.	13.50	14.07	13.21	13.82	14.08	14.12	14.29
Fibre per cent.	14.96	14.56	14.19	13.52	14.77	14.70	14.17
C.C.S.	12.32	12.69	11.90	12.51	12.91	12.89	13.12
Purity first expressed juice	87.10	85.76	85.40	85.90	87.80	87.22	87.81
Sugar—							
Tons 94 net titre	179,149	113,140	124,350	205,019	228,102	212,676	257,460
Cane per ton sugar	8.31	7.94	8.55	8.10	7.90	8.01	7.83
Pol per cent.	98.80	98.80	98.94	98.90	99.00	98.83	98.57
Net titre	97.33	97.24	97.55	97.51	97.68	97.26	96.64
Dilution indicator	34.0	28.6	31.5	29.6	32.8	35.9	34.8
Pol per cent. pol cane	85.32	85.61	84.62	85.03	85.82	84.58	85.75
Mud—							
Tons	52,451	35,971	37,451	57,018	65,650	61,903	71,324
Mud per cent. cane	3.66	4.02	3.56	3.47	3.70	3.69	3.59
Pol per cent.	2.53	2.42	2.70	2.67	2.73	2.91	3.08
Pol per cent. pol cane	0.69	0.70	0.72	0.67	0.72	0.76	0.77
Molasses—							
Gallons (1,000's)	6,744	4,445	5,232	7,678	7,248	7,708	8,117
Gallons per ton cane	4.53	4.97	4.97	4.67	4.09	4.59	4.09
Brix	90.75	91.27	91.77	91.71	91.57	91.84	91.99
Apparent purity	37.60	33.84	34.44	32.75	36.13	36.10	36.62
True purity	45.57	43.72	43.24	41.74	43.00	44.38	45.00
Expected purity	—	40.56	41.09	40.40	42.00	42.60	42.8
Reducing sugars/ash	—	—	—	—	—	0.88	0.90
Pol per cent. pol cane	7.55	6.92	7.98	6.54	6.42	7.34	6.42
Final Bagasse—							
Tons	437,610	275,890	317,961	477,531	567,691	518,682	588,925
Bagasse per cent. cane	30.56	30.85	30.23	29.17	32.00	30.91	29.66
Pol per cent.	1.95	2.19	2.10	2.46	2.41	2.45	2.78
Dry substance	51.40	50.47	49.87	49.46	49.29	50.73	50.89
Pol per cent. pol cane	4.42	4.83	4.75	5.19	5.48	5.35	5.77
Undetermined Loss—							
Pol per cent. pol cane	2.02	1.94	1.93	2.57	1.56	1.90	1.29
Fuels—							
Tons: Wood	3,870	4,306	3,493	4,774	4,595	4,332	2,693
Coal	351	642	511	519	308	108	99
Molasses	0	0	0	0	0	0	0

All Queensland Districts	1950	1951	1952	1953	1954	1955	1956
Cane—							
Tons	6,691,706	5,005,172	6,841,536	8,751,063	9,864,305	8,616,163	8,978,081
Pol per cent.	14.52	15.68	15.07	15.38	14.64	14.72	14.58
Fibre per cent.	12.52	12.90	12.44	12.69	13.02	13.48	13.59
C.C.S.	13.40	14.50	13.90	14.26	13.50	13.53	13.45
Purity first expressed juice	88.43	88.93	88.21	88.45	88.47	87.97	88.49
Sugar—							
Tons 94 net titre	879,844	704,342	934,614	1,220,383	1,301,245	1,135,675	1,171,870
Cane per ton sugar	7.61	7.11	7.32	7.17	7.58	7.59	7.66
Pol per cent.	98.68	98.58	98.78	98.91	98.83	98.75	98.75
Net titre	97.22	96.97	97.38	97.61	97.47	97.33	97.22
Dilution Indicator	30.0	28.4	30.5	29.9	29.9	36.5	35.0
Pol per cent. pol cane	86.00	84.79	86.21	85.88	86.00	85.20	85.72
Mud—							
Tons	180,630	139,112	171,787	246,493	274,628	244,303	261,485
Mud per cent. cane	3.27	3.36	3.23	3.36	3.41	3.45	3.52
Pol per cent.	2.88	3.32	3.56	3.02	2.71	2.84	2.60
Pol per cent. pol cane	0.65	0.74	0.70	0.67	0.63	0.66	0.63
Molasses—							
Gallons (1,000's)	24,162	19,044	25,710	34,091	35,721	33,629	31,748
Gallons per ton cane	4.33	4.66	4.62	4.69	4.44	4.74	4.28
Brix	88.55	90.20	90.04	90.22	90.34	91.25	90.72
Apparent purity	35.10	34.59	33.61	34.05	34.84	34.31	34.81
True purity	45.36	44.83	43.32	44.20	43.98	43.90	43.80
Expected purity	—	39.92	39.90	39.70	40.20	40.40	40.4
Reducing sugars/ash	—	—	—	—	—	1.32	1.30
Pol per cent. pol cane	6.07	5.82	6.25	6.09	6.28	6.63	6.14
Final Bagasse—							
Tons	1,441,560	1,123,760	1,443,759	1,934,796	2,173,657	1,991,982	2,091,940
Bagasse per cent. cane	26.11	27.15	25.93	27.03	27.01	28.10	28.18
Pol	2.40	2.68	2.60	2.91	2.67	2.69	2.63
Dry substance	51.23	51.31	51.82	51.35	51.53	51.54	51.81
Pol per cent. pol cane	4.31	4.69	4.43	5.03	4.94	5.15	5.09
Undetermined loss—							
Pol per cent. pol cane	2.97	3.96	2.41	2.53	2.15	2.38	2.42
Fuels—							
Tons: Wood	22,778	13,237	12,562	16,940	11,687	13,294	18,757
Coal	879	867	744	700	1,152	189	613
Molasses	16,709	6,577	5,951	1,206	6,982	9,093	9,183

Tons of cane, tons of sugar and tons of cane per ton of sugar include all mills. All other figures exclude C.S.R. and Rocky Point mills. Mt. Bauple is excluded from all except tons cane, tons sugar and tons cane per ton of sugar in 1950, and from all figures in following years.

Table X
Tons of Cane per ton 94 Net Titre Sugar, 1947-1956

Season	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Tons Cane per ton 94 N.T. Sugar	7.26	7.07	7.26	7.61	7.11	7.32	7.17	7.58	7.59	7.66

Table XI
Figures for 1956 Season (Totals and Arithmetic Averages)

	Northern	Central	Southern	All Districts
Tons Cane Crushed	3,197,051	3,765,908	2,015,122	8,978,081
Tons 94 N.T. Sugar made	406,172	508,238	257,460	1,171,870
Net Titre of Sugar	97.58	97.39	96.75	97.24
Tons Cane per ton 94 N.T. Sugar	7.87	7.41	7.83	7.66
C.C.S. of Cane	12.67	13.96	13.19	13.42
Coefficient of Work	98.70	96.40	97.28	97.20
Coefficient of Work E.S.G.	93.57	91.63	92.84	92.45
Crushing Rate	105.49	108.74	90.10	102.25
Lost Time per cent. Available Time	15.49	13.88	8.15	12.49
Fibre of Cane	11.72	14.22	14.32	13.67
Pol of Cane	13.80	15.06	14.35	14.55
First Expressed Juice—				
Brix	18.89	20.83	20.23	20.17
Purity	87.72	89.22	87.87	88.43
Purity—				
Clarified Juice	86.58	88.03	87.13	87.42
Syrup	86.90	88.31	87.28	87.69
Dilution per cent. First Expressed Juice	26.60	32.51	33.47	31.44
Final Bagasse—				
Pol	2.37	2.65	2.84	2.65
Dry Substance	51.80	52.48	51.01	51.87
Pol Extraction	95.86	94.76	94.02	94.78
Reduced Extraction	95.55	95.50	94.91	95.33
Final Molasses—				
Gallons per ton Cane	4.40	4.31	4.12	4.27
Brix	89.86	90.09	91.15	90.37
Apparent Purity	30.17	36.15	36.66	34.93
True Purity	42.03	44.33	44.80	43.89
Expected Purity	37.8	40.4	42.6	40.4
Reducing Sugars/Ash	2.11	1.30	0.92	1.39
Final Mud—				
Per cent. Cane	3.17	3.60	3.67	3.52
Pol per cent. Mud	2.52	2.66	3.15	2.78
Sugar—				
Pol	98.77	98.83	98.63	98.75
Reducing Sugars	0.33	0.26	0.28	0.28
Ash	0.17	0.24	0.32	0.25
Moisture	0.34	0.29	0.36	0.32
Dilution Indicator	39	33	35	35
Pol Balance—				
Sugar (Recovery)	86.21	85.22	85.68	85.59
Bagasse Loss	4.14	5.24	5.98	5.22
Molasses Loss	5.95	5.97	6.43	6.11
Mud Loss	0.58	0.63	0.79	0.67
Undetermined Loss	3.12	2.94	1.12	2.41
Boiling House Efficiency	95.28	94.55	96.48	95.34
Boiling House Efficiency E.S.G.	94.94	94.21	96.08	94.98
Fuels (as equivalent Bagasse per cent. Cane)—				
Wood	1.06	0.33	0.38	0.51
Coal	0.03	0.03	0.01	0.03
Molasses	0.78	0.00	0.00	0.18
Total added	1.87	0.36	0.39	0.72
Bagasse	25.40	31.15	30.81	29.72
Total Fuel	27.27	31.51	31.20	30.44
Crop Days	1,935	2,242	1,428	5,605

Tons of cane, tons of sugar, tons of cane per ton of sugar and crop days include all mills. All other figures exclude C.S.R. and Rocky Point Mills.

Table XII
Sugar Produced in Districts, 1956 Season, with Peak Allocations

Districts	Tons 94 Net Titre Sugar			Production per cent. Peak
	Produced	Peak	Excess Production over Peak	
Northern	406,172	468,900	-62,728	86.62
Central	508,238	480,000	+ 28,238	105.88
Southern	257,460	222,000	+ 35,460	115.97
All Districts	1,171,870	1,170,900	+ 970	100.08

Table XIII
Cane Milled and Sugar Yielded, 1956 Season

Mills	Tons Cane Crushed	* Tons 94 n.t. Sugar made	Tons Cane per ton Sugar	
			1956	1955
Mossman	211,632	27,970	7.566	8.079
Hambledon	271,153	36,753	7.378	7.687
Mulgrave	332,004	43,419	7.647	8.012
Babinda	247,336	28,342	8.727	8.966
Goondi	230,565	28,704	8.033	8.091
Mourilyan	228,597	27,786	8.227	8.434
South Johnstone	311,112	39,367	7.903	8.210
Tully	342,653	42,687	8.027	8.148
Victoria	653,736	83,387	7.840	7.426
Macknade	368,263	47,757	7.711	7.070
Northern District Totals and Averages ..	3,197,051	406,172	7.871	7.902
Invicta	209,264	27,476	7.616	7.540
Pioneer	333,371	48,260	6.908	6.891
Kalamia	352,757	50,356	7.005	6.984
Inkerman	408,497	58,515	6.981	6.804
Proserpine	325,243	41,563	7.825	7.525
Farleigh	344,875	44,876	7.685	7.184
Racecourse	370,486	48,972	7.565	7.193
Pleystowe	339,485	44,913	7.559	7.113
Marian	331,270	43,694	7.582	7.307
Cattle Creek	183,732	24,272	7.570	7.301
North Eton	224,558	30,361	7.396	7.019
Plane Creek	342,370	44,980	7.612	7.265
Central District Totals and Averages ..	3,765,908	508,238	7.410	7.153
Fairymead	316,534	37,877	8.357	8.221
Qunaba	174,021	22,396	7.770	8.038
Millaquin	351,836	46,886	7.504	7.741
Bingera	359,211	45,087	7.967	8.161
Gin Gin	134,050	15,966	8.396	8.584
Isis	342,876	43,714	7.844	8.006
Maryborough	160,703	21,314	7.540	7.806
Moreton	146,296	20,520	7.129	7.460
Rocky Point	29,595	3,700	7.999	8.912
Southern District Totals and Averages ..	2,015,122	257,460	7.827	8.011
All Districts Totals and Averages	8,978,081	1,171,870	7.661	7.587

* Local Sales included.

Table XIV

**Average Performance of Queensland Mills, excluding C.S.R. and Rocky Point Mills, 1955-1956 Seasons
(Arithmetic Averages)**

	Northern		Central		Southern		All Districts	
	1955	1956	1955	1956	1955	1956	1955	1956
Cane—								
Pol	13.61	13.80	15.57	15.06	14.16	14.35	14.68	14.55
Fibre	11.43	11.72	14.01	14.22	14.80	14.32	13.66	13.67
Purities—								
First expressed juice	87.03	87.72	88.87	89.22	87.21	87.87	87.94	88.43
Clarified juice	86.45	86.58	87.18	88.03	86.41	87.13	86.77	87.42
Syrup	86.81	86.90	87.32	88.31	86.52	87.28	86.96	87.69
Molasses—								
Gallons per ton cane	4.66	4.40	4.85	4.31	4.59	4.12	4.74	4.27
Apparent purity	31.89	30.17	34.97	36.15	36.34	36.66	34.68	34.93
Recovery overall	84.42	86.21	85.43	85.22	84.45	85.68	84.89	85.59
Recovery overall E.S.G.	84.08	85.90	85.12	84.92	84.14	85.33	84.58	85.27
Recovery on mixed juice	88.41	89.94	90.35	89.93	89.50	91.15	89.64	90.31
Recovery on mixed juice E.S.G.	88.04	89.61	90.02	89.61	89.17	90.77	89.30	89.97
Boiling House efficiency	94.02	95.28	95.12	94.55	95.08	96.48	94.85	95.34
Boiling House efficiency E.S.G.	93.63	94.94	94.77	94.21	94.72	96.08	94.49	94.98
Pol extraction	95.50	95.86	94.55	94.76	94.36	94.02	94.71	94.78
Reduced extraction	95.01	95.55	95.23	95.50	95.36	94.91	95.22	95.33
C.C.S.	12.42	12.67	14.40	13.96	12.94	13.19	13.49	13.42
Coefficient of work	97.17	98.70	96.87	96.40	96.69	97.28	96.88	97.20
Coefficient of work E.S.G.	92.17	93.57	92.03	91.63	92.08	92.84	92.08	92.45

TABLE XV

Analysis of Gross Time, 1956 Season, excluding C.S.R. and Rocky Point Mills

	Total Hours	Per Cent. Gross Total Hours	Per Cent. of Available Hours
Crushing Time	72,262.79	63.80	87.35
Lost Time—			
Manufacture	4,281.91	3.78	5.18
Cane Supply	6,179.97	5.46	7.47
Total Available Hours	82,724.67	73.04	100.00
Premeditated and Week-end Stops	30,538.75	26.96	—
Gross Total Hours	113,263.42	100.00	—

Table XVI

Total Crop Days, All Mills, 1947-1956

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Total Crop Days ..	4,289	5,708	5,593	6,469	4,089	5,046	5,515	6,110	5,397	5,605

**Average Crushing Rates, 1947-1956, excluding C.S.R. and Rocky Point Mills
(Arithmetic Averages)**

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Tons cane per hour ..	60.55	66.33	68.74	72.35	71.47	78.28	87.15	93.51	97.20	102.25

Table XVII
***Fuels Calculated as Equivalent Bagasse Per Cent. Cane, 1947-1956**
(Arithmetic Averages)

Year					Wood	Coal, etc.	Molasses	Total Added	Bagasse	Total Fuel
Northern District										
1947	..	..	..	..	1.167	0.005	0.913	2.085	22.988	25.073
1948	..	..	..	..	0.672	—	1.535	2.207	23.063	25.270
1949	..	..	..	..	0.726	—	1.102	1.828	23.242	25.070
1950	..	..	..	..	1.050	—	1.878	2.928	24.468	27.396
1951	..	..	..	..	0.598	—	1.220	1.818	27.169	28.987
1952	..	..	..	..	0.598	—	0.640	1.238	27.413	28.651
1953	..	..	..	..	0.562	—	0.111	0.673	25.413	26.086
1954	..	..	..	..	0.308	0.008	0.434	0.750	23.952	24.702
1955	..	..	..	..	0.550	0.010	0.627	1.187	24.945	26.132
1956	..	..	..	..	1.057	0.025	0.777	1.859	25.402	27.261
Central District										
1947	..	..	..	..	1.487	0.025	0.019	1.531	28.068	29.599
1948	..	..	..	..	1.617	0.037	0.002	1.656	28.497	30.153
1949	..	..	..	..	0.899	0.153	0.005	1.057	27.397	28.454
1950	..	..	..	..	0.763	0.053	0.001	0.817	29.731	30.548
1951	..	..	..	..	0.564	0.028	—	0.592	32.369	32.961
1952	..	..	..	..	0.331	0.029	—	0.360	30.507	30.867
1953	..	..	..	..	0.359	0.018	—	0.377	28.334	28.711
1954	..	..	..	..	0.182	0.008	—	0.190	29.420	29.610
1955	..	..	..	..	0.236	0.003	—	0.239	30.651	30.890
1956	..	..	..	..	0.326	0.034	—	0.360	31.148	31.508
Southern District										
1947	..	..	..	..	3.785	0.141	—	3.926	30.388	34.314
1948	..	..	..	..	1.977	0.009	0.012	1.998	31.010	33.008
1949	..	..	..	..	1.633	0.016	—	1.649	32.138	33.787
1950	..	..	..	..	0.694	0.060	—	0.754	35.285	36.039
1951	..	..	..	..	1.362	0.164	—	1.526	34.485	36.011
1952	..	..	..	..	1.160	0.110	—	1.270	33.614	34.884
1953	..	..	..	..	0.956	0.078	—	1.034	29.309	30.343
1954	..	..	..	..	0.845	0.044	—	0.889	31.767	32.656
1955	..	..	..	..	0.774	0.017	—	0.791	31.980	32.771
1956	..	..	..	..	0.378	0.012	—	0.390	30.806	31.196
All Queensland Districts										
1947	..	..	..	..	2.238	0.062	0.226	2.526	27.684	30.210
1948	..	..	..	..	1.519	0.018	0.374	1.911	28.098	30.009
1949	..	..	..	..	1.122	0.067	0.266	1.455	28.106	29.561
1950	..	..	..	..	0.808	0.043	0.434	1.285	30.225	31.510
1951	..	..	..	..	0.818	0.063	0.282	1.163	31.820	32.983
1952	..	..	..	..	0.648	0.047	0.148	0.843	30.748	31.591
1953	..	..	..	..	0.589	0.032	0.026	0.647	27.960	28.607
1954	..	..	..	..	0.414	0.018	0.100	0.532	28.880	29.412
1955	..	..	..	..	0.474	0.009	0.145	0.628	29.743	30.371
1956	..	..	..	..	0.510	0.025	0.179	0.714	29.717	30.431

* Excluding C.S.R. and Rocky Point Mills.

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Weipa



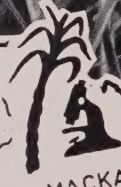
Sugar
Experiment
Station



MERINGA



AYR



MACKAY

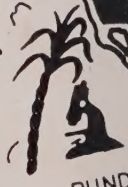
Cloncurry
Mt. Isa

Richmond

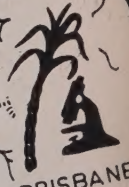
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Longreach

QUEENSLAND



BUNDABERG



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Cunnamulla

S. A.

N.

S.

W.